October 1959 Pages 477 - 512

The Journal *of the* Society of Dyers and Colourists

Volume 75 Number 10

CONTENTS

PROCEEDINGS OF THE SOCIETY

Jigger Studies
I— The Watering of Acetate Poult Fabrics— Cause and Prevention (*E. France*) 477

COMMUNICATIONS

The Separation, Estimation, Orientation, and Ultraviolet Spectra of Isomeric Azo Compounds formed by Diazo Coupling to 1-Naphthylamine and its Derivatives (*E. R. Ward, B. D. Pearson, and P. R. Wells*) 484

Chemical Modification of Flax Cellulose
I— Action of Acrylonitrile, Chloroacetic Acid, and β-Propiolactone (*N. Gokal and J. K. Skelly*) 486

CORRESPONDENCE 493

NOTES 493

NEW BOOKS AND PUBLICATIONS 494

MANUFACTURERS' PUBLICATIONS AND PATTERN CARDS 496

ABSTRACTS 497

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Number 5 October 1959

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VOLUME 1

Additional *Colour Index* Designations and Numbers

Page

1052

C.I. 19110 Monoazo — **C.I. Acid Yellow 122**

Acid Yellow RR ... ... **Adel**

Monoazo, 1:2 metal complex — **C.I. Acid Yellow 123**

HUE **Yellow**
ARTIFICIAL LIGHT: unchanged
Vondalan Yellow GL ... ... **Vond**

C.I. Acid Yellow 124

HUE **Bright Reddish Yellow**
Lanamid Yellow GA ... ... **NAC**

1090

Monoazo, 1:2 metal complex — **C.I. Acid Orange 90**

HUE **Reddish Orange**
ARTIFICIAL LIGHT: unchanged
Vondalan Orange RL ... ... **Vond**

Monoazo, 1:2 metal complex — **C.I. Acid Orange 91**

HUE **Orange**
ARTIFICIAL LIGHT: unchanged
Vondalan Yellow 2RL ... ... **Vond**

1189

Monoazo, 1:2 metal complex — **C.I. Acid Red 244**

HUE **Red**
ARTIFICIAL LIGHT: unchanged
Vondalan Red GL ... ... **Vond**

Monoazo, 1:2 metal complex — **C.I. Acid Red 245**

HUE **Yellowish Red**
ARTIFICIAL LIGHT: unchanged
Vondalan Orange 3RL ... ... **Vond**

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VOLUME 1

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Page

1052

C.I. 19110 Monoazo — **C.I. Acid Yellow 122**

Acid Yellow RR ... ... **Adel**

Monoazo, 1:2 metal complex — **C.I. Acid Yellow 123**

HUE **Yellow**
ARTIFICIAL LIGHT: unchanged
Vondalan Yellow GL ... ... **Vond**

C.I. Acid Yellow 124

HUE **Bright Reddish Yellow**
Lanamid Yellow GA ... ... **NAC**

1090

Monoazo, 1:2 metal complex — **C.I. Acid Orange 90**

HUE **Reddish Orange**
ARTIFICIAL LIGHT: unchanged
Vondalan Orange RL ... ... **Vond**

Monoazo, 1:2 metal complex — **C.I. Acid Orange 91**

HUE **Orange**
ARTIFICIAL LIGHT: unchanged
Vondalan Yellow 2RL ... ... **Vond**

1189

Monoazo, 1:2 metal complex — **C.I. Acid Red 244**

HUE **Red**
ARTIFICIAL LIGHT: unchanged
Vondalan Red GL ... ... **Vond**

Monoazo, 1:2 metal complex — **C.I. Acid Red 245**

HUE **Yellowish Red**
ARTIFICIAL LIGHT: unchanged
Vondalan Orange 3RL ... ... **Vond**

Page

1227

Monoazo, 1:2 metal complex

C.I. Acid Violet 82

HUE **Reddish Violet**
ARTIFICIAL LIGHT: slightly redder
Vondalan Bordeaux 2RL ... ... **Vond**

Monoazo, 1:2 metal complex

C.I. Acid Violet 83

HUE **Bluish Violet**
ARTIFICIAL LIGHT: slightly redder
Vondalan Corinth BL ... ... **Vond**

1305

C.I. Acid Blue 176

Similar in usage and properties to, but not identical with, **C.I. Acid Blue 69**

HUE **Blue**
Alizarine Fast Blue FP ... ... **LBH**

1404

Monoazo, 1:2 metal complex

C.I. Acid Black 99

HUE **Bluish Grey**
ARTIFICIAL LIGHT: slightly redder
Vondalan Grey BL ... ... **Vond**

Monoazo, 1:2 metal complex

C.I. Acid Black 100

HUE **Bluish Grey**
ARTIFICIAL LIGHT: redder
Vondalan Grey 3RL ... ... **Vond**

1729

C.I. Disperse Blue 41

HUE **Bright Blue**
Nacelan Blue KLT ... ... **NAC**

Amendments

Page	*Colour Index Designation*		
1003	**C.I. Acid Yellow 1**	*add*	**Ext.D&C Yellow No. 7** ... ... **CCC, ICI, KO, NAC, W, WJ**
		add	**Ext.D&C Yellow No. 8**
			Note—**Ext.D&C Yellows Nos. 7** and **8** are the sodium and potassium salts respectively
1008	**C.I. Acid Yellow 11**	*add*	**Flavazine L** ... ... **Adel**
1011	**C.I. Acid Yellow 18**	*add*	**Acid Yellow G** ... ... **Adel**
1014	**C.I. Acid Yellow 25**	*add*	**Pernilan Yellow R** ... ... **Vond**
1015	**C.I. Acid Yellow 27**	*add*	**Java Yellow S** ... ... **Vond**
1016	**C.I. Acid Yellow 29**	*add*	**Java Light Yellow 2GL** ... ... **Vond**
1019	**C.I. Acid Yellow 36**	*add*	**Eniacid Metanil Yellow GN** ... ... **Enia**
		add	**Java Metanil Yellow G** ... ... **Vond**
1027	**C.I. Acid Yellow 54**	*add*	**Chrome Intra Yellow EL** ... ... **Vond**
1056	**C.I. Acid Orange 7**	*add*	**Acid Orange YP** ... ... **NAC**
1062	**C.I. Acid Orange 19**	*add*	**Pernilan Red GG** ... ... **Vond**
	C.I. Acid Orange 20	*add*	**Eniacid Orange I** ... ... **Enia**
		add	**Orange I Extra Conc. A Export** ... **Fran**
1069	**C.I. Acid Orange 36**	*add*	**Pernilan Orange G** ... ... **Vond**
1081	**C.I. Acid Orange 64**	*delete*	**Neutranyl Fast Golden Brown** ... **NAC**
		add	**Lanamid Golden Brown** ... ... **NAC**
1084	**C.I. Acid Orange 74**	*add*	**Chrome Intra Orange G** ... ... **Vond**

Page	*Colour Index Designation*			
1088	**C.I. Acid Orange 85**		*add*	**Lanamid Yellow 2RL ... ... NAC**
1089	**C.I. Acid Orange 88**		*add*	**Lanamid Orange RL ... ... NAC**
1091	**C.I. Acid Red 1**		*add*	**Eniacid Light Red 3G ... ... Enia**
1094	**C.I. Acid Red 7**		*add*	**Azogrenadine S ... ... Adel**
	C.I. Acid Red 8		*add*	**Scarlet A ... ... Adel**
1096	**C.I. Acid Red 12**		*add*	**Chrome Blue 3B ... ... Adel**
1097	**C.I. Acid Red 14**		*add*	**Eniacid Brilliant Rubine 3B ... ... Enia**
			add	**Java Chromotrope Blue FB ... ... Vond**
1098	**C.I. Acid Red 17**		*add*	**Bordeaux B Extra Conc. A Export ... Fran**
1099	**C.I. Acid Red 18**		*add*	**Java Scarlet 3R ... ... Vond**
			add	**Ponceau 3R ... ... Adel**
			add	**Pontacyl Scarlet RR ... ... DuP**
1101	**C.I. Acid Red 23**		*add*	**Azogrenadine L ... ... Adel**
1103	**C.I. Acid Red 27**		*add*	**Wool Bordeaux 6RK ... ... Adel**
1106	**C.I. Acid Red 34**		for	**Light Fast Rubinol BL ... ... Acna** (*see A & A* p. 4556)
			read	**Light Fast Rubine BL ... ... Acna** (correct as originally printed)
1107	**C.I. Acid Red 35**		*add*	**Pernilan Red 3B ... ... Vond**
			add	**Wool Red 3B ... ... Adel**
1111	**C.I. Acid Red 44**		*add*	**Ponceau 6R ... ... Adel**
1130	**C.I. Acid Red 88**		*add*	**Fast Red A ... ... Adel**
1134	**C.I. Acid Red 97**		*add*	**Java Brilliant Fast Red G ... ... Vond**
1142	**C.I. Acid Red 115**		*delete*	**Eniacromo Bordeaux R ... ... Enia**
1154	**C.I. Acid Red 141**		*add*	**Fast Red V ... ... Adel**
1169	**C.I. Acid Red 182**		*delete*	**Neutranyl Fast Red 3BS ... ... NAC**
			add	**Lanamid Red 3BS ... ... NAC**
1191	**C.I. Acid Violet 1**		*add*	**Wool Violet RL ... ... Adel**
1192	**C.I. Acid Violet 3**		*add*	**Wool Violet 4BS ... ... Adel**
1197	**C.I. Acid Violet 13**		*add*	**Wool Violet 2R ... ... Adel**
1201	**C.I. Acid Violet 21**		*add*	**Pontacyl Violet 4BL ... ... DuP**
1227	**C.I. Acid Violet 78**		*add*	**Lanamid Violet DL ... ... NAC**
1230	**C.I. Acid Blue 3**		*add*	**New Patent Blue Extra Pure A ... Fran**
1240	**C.I. Acid Blue 25**		*add*	**Alizarine Blue A ... ... Vond**
1247	**C.I. Acid Blue 42**		*add*	**Peri Wool Blue B ... ... Adel**
1260	**C.I. Acid Blue 69**	in the heading	*add*	**C.I.63610**
			delete	**Alizarine Fast Blue FP ... ... LBH**
1263	**C.I. Acid Blue 75**		*delete*	**Pontacyl Violet 4BL ... ... DuP**
1280	**C.I. Acid Blue 113**		*add*	**Eniacid Cloth Blue 5R ... ... Enia**
1283	**C.I. Acid Blue 120**		*add*	**Eniacid Cloth Blue GR ... ... Enia**
			delete	The following brand is similar **Pontacyl Fast Blue GB ... ... DuP**
1287	**C.I. Acid Blue 129**		*add*	**Brilliant Alizarine Sky Blue BS ... NAC**
1299	**C.I. Acid Blue 158–158A** under **C.I. Acid Blue 158—C.I. 14880**		*add*	**Chromacyl Blue GG ... ... DuP**
			add	**Palatine Fast Blue GGN ... ... Adel**
	under **C.I. Acid Blue 158 or 158A**		*delete*	**Chromacyl Blue GG ... ... DuP** (*see A & A* List No. 1)
1312	**C.I. Acid Green 12**		*add*	**Palatine Fast Green BLN ... ... Adel**
1318	**C.I. Acid Green 25**		*add*	**Alizarine Light Green GNS ... ... S**
1335	**C.I. Acid Brown 17**		*add*	**Naphthanol Brown R ... ... Adel**
1340	**C.I. Acid Brown 29**		*delete*	**Neutranyl Fast Brown RD ... ... NAC**
			add	**Lanamid Brown RD ... ... NAC**
1355	**C.I. Acid Brown 88**		*add*	**Leather Brown G ... ... Adel**
1375	**C.I. Acid Black 1**		*add*	**Blue Black 12B ... ... Adel**
1376	**C.I. Acid Black 2**		*add*	**Enia Nigrosine BSA ... ... Enia**
			add	**Nigrosine Crystals SB Water Soluble Acna**
			add	**Water Nigrosine SB Crystals ... ... Acna**
			add	**Water Nigrosine WL, WLA ... ... Adel**
1383	**C.I. Acid Black 21**		*add*	**Java Milling Black G ... ... Vond**
1384	**C.I. Acid Black 24**		*add*	**Sulphone Black BB ... ... Adel**
1386	**C.I. Acid Black 29**		*add*	**Neutral Black BSS ... ... NAC**

Page	*Colour Index Designation*		
1393	**C.I. Acid Black 48**	*add*	**Alizarine Grey GGLW ... ... Adel**
1399	**C.I. Acid Black 63**	in the heading *add*	**Monoazo** (metallised) similar to **C.I. 12195**
1452	**C.I. Mordant Red 3**	*add*	**Alizarine S Extra Conc. A Export ... Fran**
		add	**Alizarine S Extra Pure A ... ... Fran**
1453	**C.I. Mordant Red 5**	*add*	**Chrome Bordeaux A ... ... Adel**
		add	**Eniacromo Garnet A ... ... Enia**
1460	**C.I. Mordant Red 19**	*add*	**Chrome Red 3G ... ... Adel**
1481	**C.I. Mordant Violet 2**	*add*	**Eniacromo Bordeaux R ... ... Enia**
1504	**C.I. Mordant Blue 3**	*add*	**Chrome Blue 3R ... ... Adel**
1506	**C.I. Mordant Blue 7**	*add*	**Alizarol Cyanone BLL ... ... NAC**
1533	**C.I. Mordant Green 9**	*delete*	**Pontachrome Green G ... ... DuP**
1545	**C.I. Mordant Green 36**	*add*	**Pontachrome Green G ... ... DuP**
1551	**C.I. Mordant Brown 1**	*add*	**Alizarine Brown EB ... ... Adel**
		add	**Chromate Brown EBNL ... ... DuP**
1557	**C.I. Mordant Brown 15**	*add*	**Chrome Brown KE ... ... Adel**
		add	**Java Chrome Brown KE ... ... Vond**
1585	**C.I. Mordant Black 1**	*add*	**Eniacromo Black A ... ... Enia**
1588	**C.I. Mordant Black 7**	*add*	**Chrome Black PBB ... ... Adel**
1590	**C.I. Mordant Black 11**	*add*	**Eniacromo Black PA ... ... Enia**
1593	**C.I. Mordant Black 17**	*add*	**Chrome Blue Black BSS ... ... Adel**
		add	**Superchrome Blue ZFAM ... ... NAC**
1619	**C.I. Basic Yellow 2**	*add*	**Auramine ... ... Adel**
		add	**Auramine O Extra Conc. A Export ... Fran**
1623	**C.I. Basic Orange 2**	*add*	**Chrysoidine G ... ... Adel**
1628	**C.I. Basic Orange 21**	*add*	**Sevron Orange G ... ... DuP**
1632	**C.I. Basic Red 13**	*add*	**Nabor Brilliant Pink 2B ... ... NAC**
1633	**C.I. Basic Violet 1**	*add*	**Eniamethyl Violet 2B, 3B ... ... Enia**
		add	**Violet RA Export ... ... Fran**
1639	**C.I. Basic Blue 4**	*add*	**Sevron Blue 5G ... ... DuP**
1648	**C.I. Basic Green 4**	*add*	**Malachite Green ... ... Adel**
1668	**C.I. Disperse Yellow 23**	*delete*	**Acetamine Fast Yellow 4RL ... ... DuP**
1682	**C.I. Disperse Orange 11**	*add*	**Celanthrene Orange Extra ... ... DuP**
1685	**C.I. Disperse Orange 17**	*add*	**Nacelan Brilliant Orange 3R ... ... NAC**
1687	**C.I. Disperse Red 1**	*add*	**Eniacyl Scarlet B ... ... Enia**
1696	**C.I. Disperse Red 19**	*add*	**Eniacyl Scarlet B2G ... ... Enia**
1706	**C.I. Disperse Violet 4**	*transfer*	**Celanthrene Violet CB ... ... DuP** to listing under "The following brands are similar"
1735	**C.I. Disperse Black 1**	*add*	**Latyl Diazo Black B ... ... DuP**
1738	**C.I. Disperse Black 9**	*add*	**Diazacyl Black GM ... ... Enia**
1775	**C.I. Food Yellow 1**	*add*	**Naphthol Yellow S Extra Conc. A Export ... ... Fran**
		delete	**FD&C Yellow No. 1 ... ... CCC, ICI, KO, NAC, W, WJ**
		delete	**FD&C Yellow No. 2**
	under Included in 'permitted' lists for USA (FD&C Yellows Nos. 1 and 2)	*read*	permitted in USA for external drug and cosmetic use only (Ext.D&C Yellows Nos. 7 and 8)
	C.I. Food Yellow 2	*delete*	**Acid Yellow 2SA Export ... ... Fran**
	C.I. Food Yellow 3	*add*	**Eniacid Sunset Yellow ... ... Enia**
		add	**Sun Yellow Extra Pure A ... ... Fran**
1776	**C.I. Food Yellow 4**	*add*	**Tartrazine Extra Pure A ... ... Fran**
1777	**C.I. Food Yellow 8**	*add*	**Chrysoïne Extra Pure A ... ... Fran**
1778	**C.I. Food Yellow 10**	*delete*	**Organol Yellow ANA Export ... ... Fran**
		delete	**FD&C Yellow No. 3 ... ... AAP, CCC, DC, KO, NAC, WJ**
	under Included in 'permitted' lists for USA (FD&C Yellow No. 3)	*read*	permitted in USA for external drug and cosmetic use only (Ext.D&C Yellow No. 9)

Page	*Colour Index Designation*		
1778	**C.I. Food Yellow 11**	*delete*	**Organol Yellow TNA Export ... ... Fran**
		delete	**FD&C Yellow No. 4 ... ... AAP, CCC, DC, KO, NAC, WJ**
	under Included in 'permitted' lists for USA (FD&C Yellow No. 4)	*read*	permitted in USA for external drug and cosmetic use only (Ext.D&C Yellow No. 10)
1779	**C.I. Food Yellow 13**	*add*	**Quinoline Yellow Extra Pure A ... Fran**
1781	**C.I. Food Orange 1**	*delete*	**Croceine Orange RA Export ... ... Fran**
1783	**C.I. Food Red 2**	*add*	HUE **Yellowish Red**
		add	**Acid Scarlet JN Extra Pure A ... ... Fran**
1783	**C.I. Food Red 3**	*add*	**Nacarat Extra Pure A... ... ... Fran**
1784	**C.I. Food Red 4**	*delete*	**Fast Red Extra Conc. A ... ... Fran**
1785	**C.I. Food Red 7**	*delete*	**New Coccine Extra Conc. A ... ... Fran**
		add	**New Coccine Extra Conc. A Export ... Fran**
		add	**New Coccine Extra Pure A ... ... Fran**
	C.I. Food Red 9	*delete*	**Bordeaux S Extra Conc. A ... ... Fran**
		add	**Bordeaux S Extra Conc. A Export ... Fran**
		add	**Bordeaux S Extra Pure A ... ... Fran**
1787	**C.I. Food Red 14**	*delete*	**Erythrosine Extra Conc. A ... ... Fran**
		add	**Erythrosine Extra Conc. A Export ... Fran**
		add	**Erythrosine Extra Pure A ... ... Fran**
1789	**C.I. Food Violet 1**	*add*	**Milling Violet S4BA Export ... ... Fran**
1791	**C.I. Food Blue 1**	*add*	**Indigotine Extra Pure A ... ... Fran**
	C.I. Food Blue 3	*add*	**Brilliant Acid Blue VS Extra Conc. A Export ... ... Fran**
1793	**C.I. Food Green 1**	*delete*	**Sulpho Green 2BA Export ... ... Fran**
	C.I. Food Green 2	*delete*	**Acid Green J Extra Conc. A ... ... Fran**
1797	**C.I. Food Black 1**	*add*	**Brilliant Acid Black BN Extra Pure A Fran**
		add	**Brilliant Acid Black BNA Export ... Fran**

Appendix II

Dyes permitted for use in USA

1800	*delete*	**FD&C Yellow No. 1**	10316	Food Yellow 1	Acid Yellow 1
		FD&C Yellow No. 2			
	delete	**FD&C Yellow No. 3**	11380	Food Yellow 10	Solvent Yellow 5
	delete	**FD&C Yellow No. 4**	11390	Food Yellow 11	Solvent Yellow 6
1802	*add*	**Ext.D&C Yellow No. 7**	10316 (Sodium salt)		Acid Yellow 1
		Ext.D&C Yellow No. 8	10316 (Potassium salt)		Acid Yellow 1
		Ext.D&C Yellow No. 9	11380		Solvent Yellow 5
		Ext.D&C Yellow No. 10	11390		Solvent Yellow 6

VOLUME 2

Additional *Colour Index* Designations and Numbers

2074

C.I. 22190 Disazo — **C.I. Direct Orange 101**

HUE **Bright Orange**
Benzo Orange CG ... ... FBy
Milling Orange G ... ... NAC

2168

Disazo (metallised) — **C.I. Direct Violet 89**

HUE **Reddish Violet**
Diazol Light Bordeaux 2BL ... ... Fran

2142

C.I. 35785 Polyazo — **C.I. Direct Red 194**

Solex Bordeaux ... ... Adel

Page

2142

C.I. Direct Red 195

HUE **Dull Yellowish Red**

Solantine Brown 4RLVF ... ... **NAC**

2236

C.I. 51305 Oxazine

C.I. Direct Blue 190

HUE **Bright Blue**

Diazol Light Pure Blue FFB ... ... **Fran**

C.I. Direct Blue 191

HUE **Bright Blue**

Solantine Blue 8GLVF ... ... **NAC**

2324

C.I. 13220 Monoazo

C.I. Direct Brown 191

HUE **Reddish Brown**

Padding Brown N ... ... **Fran**

2367

C.I. 53150 Sulfer

C.I. Sulphur Yellow 12
C.I. Solubilised Sulphur Yellow 12

HUE **Yellow**

C.I. Sulphur Yellow 12

Sulfanol Yellow JCL ... ... **Fran**

C.I. Solubilised Sulphur Yellow 12

Applied by method 4

Heliasol Yellow JCL ... ... **Fran**

2384

C.I. Sulphur Blue 16

HUE **Reddish Blue**

Applied by method 1

Sulfur Direct Blue N ... ... **NAC**

2477

Anthraquinone

C.I. Vat Red 50

HUE **Bluish Pink**

Solanthrene Red BJ ... ... **Fran**

2563

C.I. 73660 Indigoid

C.I. Vat Black 35

HUE **Greenish Grey → Black**

Solanthrene Grey 3BL ... ... **Fran**

Solanthrene Printing Black BJL ... ... **Fran**

C.I. Vat Black 36

HUE **Black**

Carbanthrene Printing Black BBD... ... **NAC**

2612

C.I. Azoic Diazo Component 110

Diazotype Blue 3RDZ Salt ... ... **NAC**

Page

2612

C.I. Azoic Diazo Component 111

Diazotype Blue 3RD Salt ... ... NAC

2678

C.I. Azoic Black 10

HUE **Black**

Eniagem Black TG ... ... Enia

2724

C.I. 77201 Inorganic

C.I. Pigment Orange 23

HUE **Yellowish Orange → Reddish Orange**

Mercadium Orange ... ... IMP

2762

C.I. 12370 Monoazo

C.I. Pigment Red 112

Segnale Light Red FGR ... ... Acna

C.I. 77201 Inorganic

C.I. Pigment Red 113

HUE **Yellowish Red → Bordeaux**

Mercadium Reds and Maroons ... ... IMP

2809

C.I. 77230 Inorganic

C.I. Pigment White 28

Used as a white filler in paper to replace TiO_2 when fluorescent brightening agents are used

Calcium Silicate

Baysical K ... ... FBy

2832

C.I. Solvent Yellow 53

HUE **Bright Greenish Yellow**

Plasto Yellow MGSM ... ... NAC

2865

C.I. Solvent Red 74

HUE **Bright Bluish Red**

Iosol Red 4B ... ... NAC

C.I. Solvent Red 75

HUE **Bright Bluish Red**

Spirit Soluble Fast Red 3B ... ... NAC

C.I. Solvent Red 76

HUE **Bright Yellowish Red**

Spirit Soluble Fast Red 3R ... ... NAC

2883

C.I. Solvent Blue 39

HUE **Bright Reddish Blue**

Spirit Soluble Fast Blue RBF ... ... NAC

Page
2904

C.I. Solvent Black 20

HUE **Bluish Black**

Spirit Soluble Fast Black NJ ... ... NAC

Amendments

Page	*Colour Index Designation*		
2003	**C.I. Direct Yellow 1**	*add*	**Diazol Chrysamine J ... ... Fran**
2004	**C.I. Direct Yellow 4**	*for*	**Brilliant Yellow ... ... AD**
		read	**Brilliant Yellow ... ... Adel**
2005	**C.I. Direct Yellow 6**	*delete*	**Diazol Fast Yellow AL ... ... Fran**
2006	**C.I. Direct Yellow 8**	*add*	**Direct Yellow 6G ... ... Vond**
2008	**C.I. Direct Yellow 11**	*add*	**Direct Yellow RN ... ... Vond**
2009	**C.I. Direct Yellow 12**	*add*	**Chrysophenine G ... ... Adel**
2012	**C.I. Direct Yellow 22**	*delete*	**Diazol Yellow 3J ... ... Fran** (*see A & A* p. 4563)
2013	**C.I. Direct Yellow 24**	*delete*	**Direct Gold Yellow 3R ... ... Fran**
2014	**C.I. Direct Yellow 27**	*add*	**Solex Canary Yellow 5G ... ... Adel**
2015	**C.I. Direct Yellow 28**	*add*	**Tetramine Fast Yellow DD ... ... NCF**
2016	**C.I. Direct Yellow 29**	*add*	**Cuprodiazol Light Yellow JR ... ... Fran**
		add	**Diazol Light Yellow JMA ... ... Fran**
		add	**Enianil Fast Yellow B ... ... Enia**
		add	**Enianil Light Yellow RT ... ... Enia**
		add	**Tetramine Fast Yellow WB extra ... NCF**
2021	**C.I. Direct Yellow 42**	*delete*	**Diazol Light Yellow RLN ... ... Fran**
2022	**C.I. Direct Yellow 44**	*add*	**Diazol Light Yellow 2JS ... ... Fran**
		add	**Triantine Fast Yellow FGL ... ... Vond**
2024	**C.I. Direct Yellow 50**	*add*	**Pontamine Fast Yellow RLP ... ... DuP**
		add	**Tetramine Fast Yellow R extra ... NCF**
2025	**C.I. Direct Yellow 51**	*add*	**Diazol Light Yellow RS ... ... Fran**
2033		*delete*	**C.I. Direct Yellow 71**
2037	**C.I. Direct Orange 1**	*add*	**Cotton Fast Orange G ... ... Adel**
2039	**C.I. Direct Orange 7**	*delete*	**Diazol Brilliant Orange J ... ... Fran**
2040	**C.I. Direct Orange 8**	*add*	**Enianil Orange 2RR ... ... Enia**
2041	**C.I. Direct Orange 10**	*delete*	**Diazol Brilliant Orange R ... ... Fran**
		add	**Tolidine Orange TR ... ... Adel**
2042		*delete*	**C.I. Direct Orange 14**
2043	**C.I. Direct Orange 15**	*delete*	**Chrome Leather Orange J3R ... ... Fran**
		delete	**Diazol Orange J2R ... ... Fran**
2044	**C.I. Direct Orange 18**	*delete*	**Diazol Orange PBR ... ... Fran**
2045		*delete*	**C.I. Direct Orange 20**
2047	**C.I. Direct Orange 26**	*add*	**Enianil Brilliant Orange S ... ... Enia**
2048	**C.I. Direct Orange 29**	*transfer*	**Pontamine Fast Orange WS ... ... DuP** to listing under "The following brands are similar"
2050	**C.I. Direct Orange 34**	*add*	**Diazol Light Orange 5J ... ... Fran**
		add	**Diazol Light Orange 7JL ... ... Fran**
		add	**Triantine Fast Orange GEL ... ... Vond**
	C.I. Direct Orange 36	*delete*	**Diazol Light Orange 5J ... ... Fran**
2052	**C.I. Direct Orange 39**	*add*	**Tetramine Fast Orange GGD ... ... NCF**
2055	**C.I. Direct Orange 49**	*add*	**Diazol Light Orange JMA ... ... Fran**
		add	**Tetramine Fast Orange R extra ... NCF**
2059	**C.I. Direct Orange 60**	*delete*	**Calcodur Orange E3GL ... ... CCC**
2062	**C.I. Direct Orange 69**	*delete*	**Diazol Light Orange R ... ... Fran**
2063	**C.I. Direct Orange 73**	*add*	**Diazamine Orange N ... ... Fran**
2070	**C.I. Direct Orange 90**	*delete*	**Diazamine Brilliant Orange 2RN ... Fran**
2072		*delete*	**C.I. Direct Orange 95**
2073		*delete*	**C.I. Direct Orange 98**
2075	**C.I. Direct Red 1**	*add*	**Chrome Leather Red F extra ... ... Fran**
2082	**C.I. Direct Red 20**	*delete*	**Diazol Pink B ... ... Fran**
2083	**C.I. Direct Red 23**	*add*	**Enianil Fast Scarlet 4BS ... ... Enia**

Page	*Colour Index Designation*			
2084	**C.I. Direct Red 24**	*add*	**Erie Fast Scarlet 4BSH ... ... NAC**	
2085	**C.I. Direct Red 26**	*add*	**Enianil Fast Scarlet 8BS ... ... Enia**	
2086	**C.I. Direct Red 28**	*add*	**Congo Red ... ... Adel**	
2087	**C.I. Direct Red 31**	*add*	**Direct Red 12B ... ... Vond**	
		add	**Enianil Fast Brilliant Red 12B ... Enia**	
2088	**C.I. Direct Red 33**	*delete*	**Diazol Fast Red FB ... ... Fran**	
2097	**C.I. Direct Red 61**	*add*	**Diazol Purpurine 9BN ... ... Fran**	
2098		*delete*	**C.I. Direct Red 66**	
2101	**C.I. Direct Red 75**	*add*	**Triantine Fast Pink B ... ... Vond**	
	C.I. Direct Red 76	*add*	**Tetramine Fast Scarlet GD ... ... NCF**	
2102	**C.I. Direct Red 77**	*add*	**Tetramine Fast Bordeaux 5B extra ... NCF**	
2103	**C.I. Direct Red 79**	*add*	**Tetramine Fast Red 6BL ... ... NCF**	
		add	**Triantine Fast Red 4BL ... ... Vond**	
	C.I. Direct Red 80	*add*	**Diazol Light Red 3B ... ... Fran**	
		add	**Triantine Fast Red F3B... ... ... Vond**	
2104	**C.I. Direct Red 81**	*add*	**Tetramine Fast Red 8B... ... ... NCF**	
2105	**C.I. Direct Red 83**	*add*	**Tetramine Fast Rubine BBLD ... NCF**	
	C.I. Direct Red 84	*add*	**Triantine Fast Brown 3RL ... ... Vond**	
2110	**C.I. Direct Red 99**	*add*	**Tetramine Fast Bordeaux RLL ... NCF**	
2113	**C.I. Direct Red 108**	*add*	**Tetramine Fast Red 6B ... ... NCF**	
2115	**C.I. Direct Red 113**	*add*	**Tetramine Fast Scarlet B extra ... NCF**	
2117	**C.I. Direct Red 117**	*add*	**Pontamine Diazo Red 7BL ... ... DuP**	
2121	**C.I. Direct Red 127–127A**			
	under **C.I. Direct Red 127—C.I. 28215**	*add*	**Pontamine Diazo Bordeaux 2BL ... DuP**	
		add	**Diazamine Light Bordeaux 2BN ... Fran**	
	under **C.I. Direct Red 127 or 127A**	*delete*	**Pontamine Diazo Bordeaux 2BL ... DuP**	
2130	**C.I. Direct Red 153**	*delete*	**Pontamine Diazo Red 7BL ... ... DuP**	
2134	**C.I. Direct Red 169**	*delete*	**Paradiazol Bordeaux B ... ... Fran**	
2144	**C.I. Direct Violet 3**	*delete*	**Diazol Violet RS ... ... Fran**	
2145	**C.I. Direct Violet 8**	*delete*	**Diazol Brilliant Violet B ... ... Fran**	
2146	**C.I. Direct Violet 9**	*add*	**Diazol Brilliant Violet B ... ... Fran**	
		add	**Enianil Brilliant Violet B ... ... Enia**	
		transfer	**Pontamine Brilliant Violet BN ... DuP** from "similar" listing to "identical"	
2150	**C.I. Direct Violet 22**	*delete*	**Diazol Violet BS ... ... Fran**	
2152	**C.I. Direct Violet 31**	*delete*	**Diazol Brilliant Violet 2B ... ... Fran**	
2155	**C.I. Direct Violet 42**	*delete*	**Diazol Violet 2BR ... ... Fran**	
	C.I. Direct Violet 43	*delete*	**Diazol Violet R ... ... Fran**	
2157	**C.I. Direct Violet 48**	*add*	**Tetramine Fast Violet B extra... ... NCF**	
	under "The following brands are similar"	*delete*	**Diazol Light Violet BLN ... ... Fran**	
2158	**C.I. Direct Violet 51**	*add*	**Tetramine Fast Violet BB extra ... NCF**	
		transfer	**Pontamine Fast Heliotrope B ... ... DuP** from "similar" listing to "identical"	
2160	**C.I. Direct Violet 57**	*add*	**Diazol Light Violet BMA ... ... Fran**	
		delete	**C.I. Direct Violet 58**	
2161		*delete*	**C.I. Direct Violet 61**	
2162	**C.I. Direct Violet 66**	*add*	**Diazol Light Violet BLN ... ... Fran**	
2164	**C.I. Direct Violet 72**	*delete*	**Diazamine Light Violet TRL ... ... Fran**	
2170	**C.I. Direct Blue 2**	*delete*	**Diazamine Black BH ... ... Fran**	
2172	**C.I. Direct Blue 6**	*delete*	**Diazamine Grey 2B ... ... Fran**	
2173	**C.I. Direct Blue 8**	*add*	**Benzoazurine G ... ... Adel**	
2176	**C.I. Direct Blue 15**	*add*	**Direct Blue HH ... ... Vond**	
2181	**C.I. Direct Blue 26**	*delete*	**Metadiazol Blue R ... ... Fran**	
2182	**C.I. Direct Blue 29**	*delete*	**Viscose Blue 3R ... ... Fran**	
2187	**C.I. Direct Blue 48**	*add*	**Diazamine Black R ... ... Fran**	
		add	**Diazol Dark Violet N ... ... Fran**	
2193	**C.I. Direct Blue 67**	*add*	**Tetramine Fast Blue D3R extra ... NCF**	
		add	**Triantine Fast Blue F3R ... ... Vond**	
2194	**C.I. Direct Blue 69**	*add*	**Triantine Fast Blue BR ... ... Vond**	

Page	*Colour Index Designation*		
2195	**C.I. Direct Blue 71**	*add*	**Tetramine Fast Blue B2R extra ... NCF**
		transfer	**Pontamine Fast Blue SFL ... ... DuP** from "similar" listing to "identical"
2196	**C.I. Direct Blue 75**	*delete*	**Pontamine Fast Blue 2GL ... ... DuP**
2197	**C.I. Direct Blue 76**	*add*	**Diazol Light Blue 7JL ... ... Fran**
		add	**Solar Blue 4GL ... ... S**
2198	**C.I. Direct Blue 78**	*add*	**Diazol Light Blue 3J ... ... Fran**
		add	**Solex Blue GLL ... ... Adel**
		add	**Tetramine Fast Blue B extra ... ... NCF**
2199	**C.I. Direct Blue 80**	*add*	**Pontamine Fast Blue 3RLN, 3RLP ... DuP**
	C.I. Direct Blue 82	*add*	**Pontamine Fast Blue 2GL ... ... DuP**
2200	**C.I. Direct Blue 84**	*add*	**Tetramine Fast Blue GB extra ... NCF**
2201	**C.I. Direct Blue 86**	*add*	**Tetramine Fast Blue D extra green ... NCF**
		add	**Triantine Fast Turquoise GL ... ... Vond**
		add	**Turquoise GLL ... ... Adel**
2205	**C.I. Direct Blue 98**	*add*	**Solex Blue FBGL, RL ... ... Adel**
2208	**C.I. Direct Blue 106**	*add*	**Solex Sky Blue GL ... ... Adel**
		add	**Triantine Fast Blue VLL ... ... Vond**
2209	**C.I. Direct Blue 110**	*delete*	**Diazol Light Blue J ... ... Fran**
	C.I. Direct Blue 111	*delete*	**Diazol Light Blue 3J ... ... Fran**
2211	**C.I. Direct Blue 116**	*delete*	**Diazol Light Violet 4B ... ... Fran**
2213	**C.I. Direct Blue 120–120A**		
	under **C.I. Direct Blue 120**	*delete*	**Pontamine Diazo Blue BR ... ... DuP**
		add	**Diazamine Leather Blue BR ... ... Fran**
	under **C.I. Direct Blue 120A**	*add*	**Pontamine Diazo Blue BR ... ... DuP**
	C.I. Direct Blue 121	*delete*	**Diazamine Blue B2R ... ... Fran**
2214	**C.I. Direct Blue 124**	*delete*	**Diazamine Pure Blue 6B ... ... Fran**
2215	**C.I. Direct Blue 128**	*delete*	**Diazamine Pure Blue 4B ... ... Fran**
2216	**C.I. Direct Blue 129**	*delete*	**Diazamine Blue 2B ... ... Fran**
2224	**C.I. Direct Blue 151**	*add*	**Cotton Blue CVB... ... ... Adel**
		add	**Enianil Blue CVB, CVBO ... ... Enia**
2225	**C.I. Direct Blue 153**	for	**Cupramine Blue GL ... ... Acna** (*see A & A* p. 4566)
		read	**Cupramina Blue GL ... ... Acna** (correct as originally printed)
2227	**C.I. Direct Blue 158**	*add*	**Cuprodiazol Light Blue NL ... ... Fran**
2233	**C.I. Direct Blue 174**	for	**Cupramine Violet 2BL ... ... Acna** (*see A & A* page 4566)
		read	**Cupramina Violet 2BL ... ... Acna** (correct as originally printed)
2239	**C.I. Direct Green 6**	*add*	**Diazol Green B ... ... Fran**
		add	**Enianil Green BBN ... ... Enia**
2240	**C.I. Direct Green 8**	*add*	**Cotton Green G ... ... Adel**
2241	**C.I. Direct Green 12**	*add*	**Chloramine Green B ... ... Adel**
2247	**C.I. Direct Green 26**	*add*	**Diazol Light Green BMA ... ... Fran**
		add	**Tetramine Fast Green B extra ... NCF**
	C.I. Direct Green 27	*add*	**Solantine Blue Green BFL ... ... NAC**
		transfer	**Pontamine Fast Green 5BL ... ... DuP** from "similar" listing to "identical"
2260		*delete*	**C.I. Direct Green 56**
2261	**C.I. Direct Green 58**	*delete*	**Diazamine Green B ... ... Fran**
		delete	**Paradiazol Green B ... ... Fran**
	C.I. Direct Green 60	*delete*	**Paradiazol Green J ... ... Fran**
2263	**C.I. Direct Brown 1–1A**		
	under **C.I. Direct Brown 1**	*delete*	**Benzo Brown D3GA-CF ... ... G**
		delete	**Pontamine Brown D3GN ... ... DuP**
		delete	**Pontamine Brown NCR ... ... DuP** (*see A & A* p. 4566)
		delete	**Pontamine Brown N3G ... ... DuP**
		add	**Honey Yellow 3GN ... ... Adel**
	under "The following brands are similar"	*add*	**Direct Brown G ... ... Vond**
	under **C.I. Direct Brown 1A**	*add*	**Benzo Brown D3GA-CF ... ... G**
		add	**Honey Yellow 3GNT ... ... Adel**
		add	**Pontamine Brown D3GN, NCR ... DuP**
2266	**C.I. Direct Brown 6**	*delete*	**Diazol Brown J ... ... Fran**
		delete	**Union Brown JO ... ... Fran**
	C.I. Direct Brown 7	*delete*	**Diazol Brown N ... ... Fran**
		delete	**Paradiazol Brown N ... ... Fran**

Page	*Colour Index Designation*		
2270	**C.I. Direct Brown 20**	*delete*	**Diazol Brown FBR ... ... Fran**
2271	**C.I. Direct Brown 24**	*delete*	**Diazol Brown EBR ... ... Fran**
2275	**C.I. Direct Brown 31**	*add*	**Trisulphone Brown B ... ... Adel**
2276	**C.I. Direct Brown 33**	*add*	**Enianil Fast Catechine B ... ... Enia**
2283	**C.I. Direct Brown 51**	*delete*	**Diazol Bronze JM ... ... Fran**
2290	**C.I. Direct Brown 73**	*delete*	**Diazol Cutch BR... ... ... Fran**
2291	**C.I. Direct Brown 74**	*delete*	**Pontamine Catechu 3GD ... ... DuP**
2295	**C.I. Direct Brown 95**	*add*	**Enianil Light Brown BRL ... ... Enia**
		add	**Pontamine Fast Brown NP ... ... DuP**
		add	**Solex Brown R ... ... Adel**
		add	**Tetramine Fast Brown BRS ... ... NCF**
2296	**C.I. Direct Brown 99**	*delete*	**Diazol Light Brown 3R ... ... Fran**
2297	**C.I. Direct Brown 101**	*add*	**Tetramine Fast Brown RT extra ... NCF**
2301	**C.I. Direct Brown 112**	*add*	**Triantine Fast Brown 8RL ... ... Vond**
		transfer	**Pontamine Fast Brown 8RL ... ... DuP** from "similar" listing to "identical"
2311		*delete*	**C.I. Direct Brown 143**
		delete	**C.I. Direct Brown 144**
2312	**C.I. Direct Brown 149**	*delete*	**Paradiazol Brown S ... ... Fran**
	C.I. Direct Brown 150	*delete*	**Paradiazol Brown BD ... ... Fran**
2314	**C.I. Direct Brown 154**	*add*	**Pontamine Brown N3G... ... ... DuP**
		delete	**C.I. Direct Brown 155**
2315	**C.I. Direct Brown 158**	*delete*	**Metadiazol Brown JO ... ... Fran**
	C.I. Direct Brown 159	*delete*	**Paradiazol Bronze J .... Fran**
2316	**C.I. Direct Brown 160**	for	**Cupramine Brown 2GL ... ... Acna** (*see A & A* p. 4567)
		read	**Cupramina Brown 2GL ... ... Acna** (correct as originally printed)
2319	**C.I. Direct Brown 171**	*delete*	**Paradiazol Brown RD ... ... Fran**
2326	**C.I. Direct Black 4**	*add*	**Cotton Black MT ... ... Adel**
	C.I. Direct Black 5	in the heading *add*	**Polyazo**
		add	**Diazol Black JMA ... ... Fran**
2328	**C.I. Direct Black 9**	*delete*	**Diazol Fast Black FB ... ... Fran**
			Pontamine Fast Black FF ... ... DuP has the constitution **C.I. 31565**
2333	**C.I. Direct Black 22**	*add*	**Benzonerol Black VS ... ... Adel**
		add	**Diazol Fast Black JN ... ... Fran**
2335	**C.I. Direct Black 28**	*delete*	**Viscose Black R ... ... Fran**
2336	**C.I. Direct Black 32**	*add*	**Diazol Fast Black JRA ... ... Fran**
2339	**C.I. Direct Black 38**	*transfer*	**Pontamine Black ULR ... ... DuP** from "identical" listing to "similar"
2340		*delete*	**C.I. Direct Black 46**
2342	**C.I. Direct Black 51**	*delete*	**Pontamine Fast Black LCW ... ... DuP**
		add	**Diazol Fast Grey L ... ... Fran**
		add	**Enianil Fast Grey LSN ... ... Enia**
		add	**Enianil Light Black L ... ... Enia**
		add	**Solex Grey L ... ... Adel**
		add	**Tetramine Fast Black O extra ... NCF**
2348		*delete*	**C.I. Direct Black 70**
2349	**C.I. Direct Black 71**	*add*	**Tetramine Fast Grey VG extra ... NCF**
2350	**C.I. Direct Black 74**	*delete*	**Diazol Light Grey 4B ... ... Fran**
2352	**C.I. Direct Black 78**	*delete*	**Diazamine Black V ... ... Fran**
2354		*delete*	**C.I. Direct Black 84**
2355		*delete*	**C.I. Direct Black 85**
2357		*delete*	**C.I. Direct Black 93**
2359		*delete*	**C.I. Direct Black 98**
2364	**C.I. Sulphur Yellow 4**	*add*	**Sulfer Yellow 3GN ... ... Vond**
2370	**C.I. Sulphur Orange 3**	*add*	**Sulfanol Orange, MJ, MR ... ... Fran**
2371	**C.I. Sulphur Red 1**	*delete*	**Sulfanol Bordeaux R ... ... Fran** (*see A & A* p. 4567)
2372	**C.I. Sulphur Red 3**	*add*	**Sulfanol Bordeaux R ... ... Fran**
		add	**Sulfanol Prune B ... ... Fran**

Page	*Colour Index Designation*		
2373	**C.I. Sulphur Red 6**		
	under "Applied by method 1"	*delete*	**Sulfanol Prune B** ... ... **Fran** (*see A & A* p. 4567)
2377	**C.I. Sulphur Blue 1**	*add*	**Sulfanol Blue B, RB** ... ... **Fran**
	C.I. Solubilised Sulphur Blue 1	*add*	Applied by method 3 **Sulfanosol Blue RB** ... ... **Fran**
2381	**C.I. Sulphur Blue 9**		
	under "Applied by method 1"	*delete*	**Sulfanol Blue B** ... ... **Fran**
2383	**C.I. Sulphur Blue 14**	*add*	**Sulfer Brilliant Blue G** ... ... **Vond**
2384	**C.I. Sulphur Blue 15**	*add*	**Sulfer Green Blue CV** ... ... **Vond**
2385	**C.I. Solubilised Sulphur Green 2**		
	under "Applied by method 3"	*add*	**Sulfanosol Green 2B** ... ... **Fran**
2393	**C.I. Sulphur Brown 1**	*delete*	**Cachou de Laval JS, RS, S** ... ... **Fran**
		delete	**Sulfanol Olive TR** ... ... **Fran**
2394	**C.I. Sulphur Brown 4**		
	under "Applied by method 1"	*delete*	**Sulfanol Brown BJ** ... ... **Fran**
		delete	**Sulfanol Yellow Brown BR** ... ... **Fran**
		add	**Cachou de Laval JS, RS** ... ... **Fran**
		add	**Sulfanol Olive TR** ... ... **Fran**
2397	**C.I. Sulphur Brown 12**	*add*	**Sulphur Brown 3R** ... ... **Adel**
2398	**C.I. Sulphur Brown 14**	*add*	**Sulfanol Brown TR** ... ... **Fran**
	C.I. Sulphur Brown 15	*add*	**Sulfanol Brown BR** ... ... **Fran**
	C.I. Solubilised Sulphur Brown 15		
	under "Applied by method 3"	*add*	**Sulfanosol Brown BR** ... ... **Fran**
2400	**C.I. Sulphur Brown 20**	*add*	**Sulfogene Brown RNCF** ... ... **DuP**
	C.I. Sulphur Brown 21	*add*	**Sulfanol Olive Yellow 5J** ... ... **Fran**
2406	**C.I. Sulphur Brown 42**		
	under "Applied by method 1"	*delete*	**Thiocutch RS** ... ... **Fran**
2412		*delete*	**C.I. Sulphur Brown 61**
2413	**C.I. Sulphur Black 1**	*add*	**Sulfanol Black MBS, MRS** ... ... **Fran**
	C.I. Solubilised Sulphur Black 1		
	under "Applied by method 3"	*add*	**Sulfanosol Black B** ... ... **Fran**
		add	**Sulfur Black BGS Solution** ... ... **NAC**
		add	**Sulfur Black BGLS Solution** ... ... **NAC**
2414	**C.I. Sulphur Black 2**		
	under "Applied by method 1"	*add*	**Sulfanol Black 2R** ... ... **Fran**
		add	**Sulfogene Gray H Grains** ... ... **DuP**
	C.I. Solubilised Sulphur Black 2		
	under "Applied by method 3"	*add*	**Sulfanosol Printing Black 2R** ... ... **Fran**
		add	**Sulfur Black RS Solution** ... ... **NAC**
	under "Applied by method 6"	*add*	**Thioblack BRS 80, B2RS 80** ... ... **Fran**
	C.I. Sulphur Black 3		
	under "Applied by method 1"	*delete*	**Vidal Olive S** ... ... **Fran**
2415	**C.I. Sulphur Black 6**		
	under "Applied by method 1"	*delete*	**Sulfanol Fast Black CLG** ... ... **Fran**
		add	**Solane Black CLJ** ... ... **Fran**
2416	**C.I. Sulphur Black 10**		
	in the heading	*add*	**C.I. Solubilised Sulphur Black 10**
		add	**C.I. Solubilised Sulphur Black 10** Applied by method 3 **Sulfur Black 8GATS Solution** ... ... **NAC**
2417	**C.I. Sulphur Black 11**		
	under "Applied by method 1"	*delete*	**Sulfanol Fast Black CL** ... ... **Fran** (*see A & A* p. 4567)
		add	**Solane Black CL, CLN** ... ... **Fran**
	C.I. Solubilised Sulphur Black 11		
	under "Applied by method 3"	*add*	**Sulfocarbon Black CGLS** ... ... **NAC**
		add	Applied by method 4 **Heliasol Black CLN** ... ... **Fran**
2428	**C.I. Vat Yellow 2**	*add*	**Ponsol Flavone GCN, GCND** ... ... **DuP**
2430	**C.I. Vat Yellow 4**	*delete*	**Ponsol Golden Yellow GK** ... ... **DuP**
		add	**Romantrene Golden Yellow FGK** ... **Acna**
2432	**C.I. Vat Yellow 9**	*delete*	**Solanthrene Yellow JF** ... ... **Fran**
2437	**C.I. Vat Yellow 21**	*delete*	**Heliane Yellow R** ... ... **Fran**
2444	**C.I. Vat Orange 2**	*add*	**Pernithrene Orange RRTS** ... **Vond**
		add	**Solanthrene Orange 2R** ... ... **Fran**
	C.I. Solubilised Vat Orange 2	*add*	**Solvat Golden Orange RRT** ... ... **NAC**
2445	**C.I. Solubilised Vat Orange 3**	*add*	**Solasol Brilliant Orange RS** ... ... **Fran**
2446	**C.I. Vat Orange 4**	*add*	**Solanthrene Orange 4R** ... ... **Fran**

Page	*Colour Index Designation*		
2454	**C.I. Vat Orange 20**	*delete*	**Solanthrene Orange 5J ... ... Fran**
	C.I. Vat Orange 21	*delete*	**Solanthrene Orange 4J ... ... Fran**
2455	**C.I. Vat Red 1**	*add*	**Solanthrene Brilliant Pink RF ... Fran**
2458	**C.I. Vat Red 6**	*add*	**Solanthrene Scarlet B ... ... Fran**
	C.I. Solubilised Vat Red 6	*add*	**Solasol Scarlet BS ... ... Fran**
2460	**C.I. Vat Red 10**	*add*	**Pernithrene Red FBB ... ... Vond**
2462	**C.I. Vat Red 13**	*add*	**Carbanthrene Red G2BP ... ... NAC**
2467	**C.I. Vat Red 26**	*delete*	**Heliane Scarlet R ... ... Fran**
2473	**C.I. Vat Red 41**	*add*	**Heliane Red 5B ... ... Fran**
2474	**C.I. Vat Red 42**	*delete*	**Solanthrene Red 5J ... ... Fran**
2479	**C.I. Vat Violet 1**	*delete*	**Ponsol Violet RR ... ... DuP**
		delete	**Solanthrene Brilliant Violet 3R ... Fran**
	C.I. Solubilised Vat Violet 1	*add*	**Solasol Brilliant Violet 4RS ... ... Fran**
2485	**C.I. Vat Violet 9**	*add*	**Solanthrene Brilliant Violet 3B ... Fran**
2488	**C.I. Vat Violet 15**	*delete*	**Solanthrene Brilliant Violet 2B ... Fran**
2489	**C.I. Vat Violet 17**	*delete*	**Solanthrene Brilliant Violet R ... Fran**
2491	**C.I. Vat Blue 1**	*add*	**Synthetic Indigo TS ... ... Fran**
	C.I. Reduced Vat Blue 1	*add*	**Reduced Indigo Solution C ... ... Fran**
		add	**Reduced Synthetic Indigo Grains ... Fran**
	C.I. Reduced Vat Blue 1A	*add*	**Reduced Indigo Solution L ... ... Fran**
	C.I. Solubilised Vat Blue 1	*delete*	**Solasol Indigo N ... ... Fran**
2494	**C.I. Vat Blue 4**	*add*	**Pernithrene Blue RS ... ... Vond**
	under "Purified forms"	*delete*	**Solanthrene Brilliant Blue R ... Fran**
		add	**Solanthrene Blue R for sugar ... Fran**
	under "Special physical forms for paper, lacquers, etc."	*add*	**Lutetia Fast Blue RS ... ... Fran**
		add	**Latexol Fast Blue SD ... ... Fran**
		add	**Celloide Blue RN ... ... Fran**
		add	**Vulcafix Fast Blue SD ... ... Fran**
2495	**C.I. Vat Blue 5**	*delete*	**Indigo 4BR ... ... Fran**
		delete	"The following brands are similar" **Sulfanthrene Blue 2BD, 2BP ... ... DuP**
		transfer	**Sulfanthrene Blue 2B ... ... DuP** from "similar" listing to "identical"
	C.I. Solubilised Vat Blue 5	*add*	**Solasol Indigo 4B ... ... Fran**
2496	**C.I. Vat Blue 6**	*delete*	**Indanthrone Blue ... ... DuP**
		add	**Pernithrene Blue BC ... ... Vond**
		add	**Ponsol Blue BFP ... ... DuP**
	under "The following brands are similar"	*add*	**Solanthrene Brilliant Blue RCL ... Fran**
2499	**C.I. Vat Blue 11**	*delete*	**Solanthrene Blue JN ... ... Fran**
2500	**C.I. Vat Blue 12**	*delete*	**Solanthrene Blue 3J ... ... Fran**
2501	**C.I. Vat Blue 14**	*add*	**Pernithrene Blue GCD ... ... Vond**
	C.I. Vat Blue 15	*delete*	**Solanthrene Blue 3JF ... ... Fran**
2502	**C.I. Vat Blue 16**	*add*	**Ponsol Navy Blue ... ... DuP**
2503	**C.I. Vat Blue 18**	*add*	**Ponsol Navy Blue RAD ... ... DuP**
	under "The following brands are similar"	*delete*	**Solanthrene Navy Blue RF ... ... Fran**
2504	**C.I. Vat Blue 20**	*add*	**Pernithrene Dark Blue BOA ... ... Vond**
2510	**C.I. Vat Blue 34**	*add*	**Reduced Indigo Solution 2R ... ... Fran**
2514	**C.I. Vat Blue 43**	*add*	**Redon Blue 2R, RWO, 2RWO ... ... Vond**
2519	**C.I. Vat Green 1**	*delete*	**Solanthrene Brilliant Green J ... ... Fran**
		add	**Ponsol Jade Green Supra D ... DuP**
		add	**Pernithrene Brilliant Green 7FB ... Vond**
2520	**C.I. Vat Green 2**	*add*	**Pernithrene Brilliant Green GG ... Vond**
		add	**Solanthrene Brilliant Green J ... ... Fran**
2521	**C.I. Vat Green 3**	*add*	**Pernithrene Olive Green B .... Vond**
2523	**C.I. Vat Green 5**	*add*	**Solanthrene Olive Green 2J ... ... Fran**
2524	**C.I. Vat Green 8**	*delete*	**Solanthrene Khaki 2J ... ... Fran**
		add	**Pernithrene Khaki GG ... ... Vond**
2525	**C.I. Vat Green 9**	*add*	**Solanthrene Black 3BA ... ... Fran**
2527	**C.I. Vat Green 14**	*add*	**Pernithrene Olive GG ... ... Vond**
2528	**C.I. Vat Green 17**	*add*	**Solanthrene Olive 3J ... ... Fran**

Page	*Colour Index Designation*		
2532	**C.I. Vat Brown 3**	*add*	**Pernithrene Brown R ... ... Vond**
	under "Purified brands"	*delete*	**Solanthrene Brown RF ... ... Fran**
2539	**C.I. Vat Brown 20**	*add*	**Ponsol Brown BN ... ... DuP**
2551	**C.I. Vat Black 1**	*add*	**Solanthrene Printing Black BLN, TL, TLN ... ... Fran**
2554	**C.I. Vat Black 9**	*add*	**Solanthrene Direct Black RB ... ... Fran**
2560	**C.I. Vat Black 25**	*add*	**Ponsol Olive TR ... ... DuP**
2561	**C.I. Vat Black 27**	*add*	**Pernithrene Olive R ... ... Vond**
	C.I. Vat Black 28	*delete*	**Solanthrene Grey N ... ... Fran**
2575	**C.I. Azoic Diazo Component 5**	*add*	**Naphthanil Red B Base ... ... DuP**
2592	**C.I. Azoic Diazo Component 32**	*add*	**Naphthanil Red KBH ... ... DuP**
		add	**Naphthanil Red KBO Base ... ... DuP**
2595	**C.I. Azoic Diazo Component 35**	*add*	**Blue 3BVS Salt ... ... NAC**
2609	**C.I. Azoic Diazo Component 49**	*add*	**Orange RF Salt ... ... NAC**
2612	**C.I. Azoic Diazo Component 109** (new entry, see *A & A* List No. 4)	*add*	**Black BS Salt ... ... NAC**
2613	**C.I. Azoic Coupling Component 2**	*delete*	**Naphthanil AS for Lakes ... ... DuP**
		add	**Naphthanil AS Solution ... ... DuP**
2614	**C.I. Azoic Coupling Component 4**	*delete*	**Naphthanil BO ... ... DuP**
2617	**C.I. Azoic Coupling Component 13**	*delete*	**Naphthanil SG soln. ... ... DuP**
	C.I. Azoic Coupling Component 15	*add*	**Naphthanil LB ... ... DuP**
	C.I. Azoic Coupling Component 16	*add*	**Naphthanil DB ... ... DuP**
2623	**C.I. Azoic Coupling Component 35**	*add*	**Naphthanil LG ... ... DuP**
2629	**C.I. Azoic Yellow 1**	*add*	**Diagen Yellow AY ... ... DuP**
		add	**Eniagem Yellow GS ... ... Enia**
	C.I. Azoic Yellow 2	*add*	**Eniagem Yellow 3G ... ... Enia**
2630	**C.I. Azoic Yellow 6**	*add*	**Ronagen Golden Yellow FG ... ... RL**
		add	**Sinagen Golden Yellow FG ... ... RL**
2631	**C.I. Azoic Yellow 9**	*add*	**Ronagen Yellow F3G ... ... RL**
2632	**C.I. Azoic Yellow 11**	*add*	**Ronagen Yellow F4G ... ... RL**
2635	**C.I. Azoic Orange 2**	*add*	**Eniagem Orange G ... ... Enia**
2636	**C.I. Azoic Orange 5**	*add*	**Ronagen Orange FRR ... ... RL**
	C.I. Azoic Orange 6	*add*	**Ronagen Orange FGN ... ... RL**
2641	**C.I. Azoic Red 1**	*add*	**Ronagen Scarlet FR, FRS ... ... RL**
		add	**Sinagen Scarlet FR ... ... RL**
		add	**Eniagem Scarlet RS, RSC ... ... Enia**
	C.I. Azoic Red 2	*add*	**Eniagem Red RS ... ... Enia**
2642	**C.I. Azoic Red 6**	*add*	**Eniagem Red GS ... ... Enia**
2643	**C.I. Azoic Red 9**	*add*	**Ronagen Scarlet FL ... ... RL**
2644	**C.I. Azoic Red 12**	*add*	**Ronagen Red FTR ... ... RL**
		add	**Sinagen Red FTR ... ... RL**
	C.I. Azoic Red 15	*add*	**Eniagem Red FFBB ... ... Enia**
2647	**C.I. Azoic Red 24**	*add*	**Ronagen Bordeaux FB ... ... RL**
		add	**Sinagen Bordeaux FB ... ... RL**
2655	**C.I. Azoic Red 65** (new entry, *see A & A* List No. 2)	*add*	**Ronagen Red F4G ... ... RL**
2657	**C.I. Azoic Violet 1**	*add*	**Eniagem Violet B ... ... Enia**
	C.I. Azoic Violet 3	*add*	**Ronagen Corinth FB ... ... RL**
2661	**C.I. Azoic Blue 1**	*add*	**Ronagen Navy Blue FB ... ... RL**
2662	**C.I. Azoic Blue 6**	*add*	**Eniagem Blue B ... ... Enia**
2663	**C.I. Azoic Blue 9**	*add*	**Eniagem Navy Blue B, R ... ... Enia**
	C.I. Azoic Blue 11	for	**Citazina Blue CB ... ... Acna** (*see A & A* p. 4571)
		read	**Citazene Blue CB ... ... Acna** (correct as originally printed)
2667	**C.I. Azoic Green 1**	*add*	**Eniagem Green B ... ... Enia**
2669	**C.I. Azoic Brown 2**	*add*	**Ronagen Brown FR ... ... RL**
2670	**C.I. Azoic Brown 7**	*add*	**Ronagen Brown FB ... ... RL**
		add	**Sinagen Brown FB ... ... RL**
2671	**C.I. Azoic Brown 11**	*add*	**Ronagen Brown FBR ... ... RL**
2672	**C.I. Azoic Brown 14**	*add*	**Ronagen Olive Brown FG ... ... RL**
	C.I. Azoic Brown 15	*add*	**Ronagen Brown FRR ... ... RL**

Page	*Colour Index Designation*		
2673	**C.I. Azoic Brown 17**	*add*	**Ronagen Black Brown FTR ... ... RL**
2678	**C.I. Azoic Black 5**	for	**Citazina Black CS ... ... Acna** (*see A & A* p. 4571)
		read	**Citazene Black CS ... ... Acna** (correct as originally printed)
	C.I. Azoic Black 7 (new entry, *see A & A* List No. 2)	*add*	**Ronagen Black FL ... ... RL**
		add	**Sinagen Black FL ... ... RL**
2703	**C.I. Pigment Yellow 1**	*add*	**Horicon Yellow X-1351 ... ... IMP**
		add	**Burma Yellow X-1622 ... ... IMP**
		add	**Brazil Yellow X-2866 ... ... IMP**
		add	**Hansa Yellow S-3155 ... ... IMP**
2704	**C.I. Pigment Yellow 3**	*add*	**Iroquois Yellow X-1285 ... ... IMP**
2705	**C.I. Pigment Yellow 5**	*add*	**Yellow Toner X-1954 ... ... IMP**
2706	**C.I. Pigment Yellow 10**	*add*	**Pigment Yellow X ... ... Adel**
2707	**C.I. Pigment Yellow 12**	*add*	**Verona Yellow X-1791 ... ... IMP**
		add	**Amazon Yellow X-2485 ... ... IMP**
		add	**Klondike Yellow X-2261 ... ... IMP**
	C.I. Pigment Yellow 13	*add*	**Saranac Yellow X-2838 ... ... IMP**
2708	**C.I. Pigment Yellow 14**	*add*	**Sumatra Yellow X-1940 ... ... IMP**
		and	**Sacandaga Yellow X-2476 ... ... IMP**
2712	**C.I. Pigment Yellow 32**	*add*	**Strontium Chromate X-2396 ... ... IMP**
2713	**C.I. Pigment Yellow 34**	*add*	**C.P. Chrome Yellow Light ... ... IMP**
		add	**C.P. Chrome Yellow Medium ... IMP**
		add	**C.P. Chrome Yellow Primrose ... IMP**
		add	to manufacturers' initials **IMP**
	C.I. Pigment Yellow 35	*add*	**Lithopone Cadmium Yellow Deep ... IMP**
		add	**Lithopone Cadmium Yellow Golden IMP**
		add	**Lithopone Cadmium Yellow Lemon IMP**
		add	**Lithopone Cadmium Yellow Primrose IMP**
2714	**C.I. Pigment Yellow 36**	*add*	**C.P. Zinc Yellow X-883 ... ... IMP**
		add	**C.P. Zinc Yellow X-2127 ... ... IMP**
		add	**Basic Zinc Chromate X-2259 ... ... IMP**
	C.I. Pigment Yellow 37	*add*	**Cadmium Yellow Conc. Deep ... IMP**
		add	**Cadmium Yellow Conc. Golden ... IMP**
		add	**Cadmium Yellow Conc. Lemon ... IMP**
		add	**Cadmium Yellow Conc. Primrose ... IMP**
		add	to manufacturers' initials **IMP**
2719	**C.I. Pigment Orange 2**	*add*	**Ozark Orange X-1481 ... ... IMP**
2720	**C.I. Pigment Orange 5**	*add*	**Nippon Orange X-881 ... ... IMP**
2722	**C.I. Pigment Orange 13**	*add*	**Oswego Orange X-2065 ... ... IMP**
	C.I. Pigment Orange 15	*add*	**Orange Toner X-2692 ... ... IMP**
2723	**C.I. Pigment Orange 16**	*add*	**Madras Toner X-1843 ... ... IMP**
	C.I. Pigment Orange 17 under "Aluminium lake"	*add*	**Tangarine Lake X-917 ... ... IMP**
2724	**C.I. Pigment Orange 20**	*add*	**Cadmium Orange ... ... IMP**
	C.I. Pigment Orange 21	*add*	**Chrome Orange ... ... IMP**
2725	**C.I. Pigment Red 1**	*add*	**Para Toner Light A-4329 ... ... IMP**
		add	**Para Toner Deep A-1757 ... ... IMP**
	C.I. Pigment Red 2	*add*	**Revere Red X-2198 ... ... IMP**
2726	**C.I. Pigment Red 3**	*add*	**C.P. Toluidine Toner A-2989, A-2990 IMP**
		add	**C.P. Toluidine Toner Deep X-1865 ... IMP**
		add	**Enialit Light Red RL ... ... Enia**
		add	**Toluidine Toner HR X-2700, X-2741 ... IMP**
		add	**Toluidine Toner Deep HR X-2742 ... IMP**
		add	**Segnale Light Red BR ... ... Acna**
2727	**C.I. Pigment Red 4**	*add*	**Tanager Red X-761 ... ... IMP**
	C.I. Pigment Red 5	*add*	**Marcy Red X-2640 ... ... IMP**
	C.I. Pigment Red 6	*add*	**Oneida Red X-2066 ... ... IMP**
2730	**C.I. Pigment Red 13**	*add*	**Tioga Maroon X-1997 ... ... IMP**
2732	**C.I. Pigment Red 22**	*add*	**Sparta Red X-2593 ... ... IMP**
	C.I. Pigment Red 23	*add*	**Malta Red X-2284 ... ... IMP**
2739	**C.I. Pigment Red 48** under "Calcium lake"	*add*	**Monterey Red X-2277 ... ... IMP**
		add	**Segnale Red RS ... ... Acna**
	under "Barium lake"	*add*	**Orono Red X-2478 ... ... IMP**
		add	**Segnale Red GS ... ... Acna**
	under "Manganese lake"	*add*	**Montauk Red X-2218 ... ... IMP**

Page	*Colour Index Designation*		
2740	**C.I. Pigment Red 49**		
	under "Sodium salt"	*add*	**Lithol Toner Y A-8003 ... ... IMP**
2741	under "Calcium lake"	*add*	**Lithol Toner Deep X-957 ... ... IMP**
		add	**Rubber Red X-1148 ... ... IMP**
		add	**Winthrop Red X-1666 ... ... IMP**
		add	**Tucson Maroon X-1779 ... ... IMP**
	under "Barium lake"	*add*	**Lithol Toner Light X-1095 ... ... IMP**
		add	**Lithol Toner Medium X-1096 ... IMP**
		add	**Pitcairn Red X-1585 ... ... IMP**
		add	**Red Toner Light X-1723 ... ... IMP**
2743	**C.I. Pigment Red 53**		
	under "Barium lake"	*add*	**Mohican Red A-8008 ... ... IMP**
		add	**Wayne Red X-2486 ... ... IMP**
2744	**C.I. Pigment Red 54**	*add*	**Uncas Maroon X-1972 ... ... IMP**
2745	**C.I. Pigment Red 57**		
	under "Calcium lake"	*add*	**Selkirk Red X-2028 ... ... IMP**
2747	**C.I. Pigment Red 60**		
	under "Barium lake"	*add*	**Pigment Scarlet 3BL ... ... Acna**
2748	**C.I. Pigment Red 63**		
	under "Calcium lake"	*add*	**Cayuga Maroon A-4372 ... ... IMP**
	under "Manganese lake"	*add*	**Maroon Toner X-1455 ... ... IMP**
2753	**C.I. Pigment Red 81**	*add*	**Sicilian Rose Toner A-7143 ... ... IMP**
		add	**Rose Toner X-1143 ... ... IMP**
2754	**C.I. Pigment Red 83**	*add*	**Madder Lake X-686 ... ... IMP**
2756	**C.I. Pigment Red 90**		
	under "Lead lake"	*add*	**Phlox Red Toner X-1356 ... ... IMP**
2760	**C.I. Pigment Red 104**	*add*	**Rex Orange all shades ... ... IMP**
2762	**C.I. Pigment Red 108**	*add*	**Cadmium Red all shades ... ... IMP**
2763	**C.I. Pigment Violet 1**	*add*	**Cerise Toner X-1127 ... ... IMP**
		add	**Sicilian Cerise Toner A-7127 ... ... IMP**
2764	**C.I. Pigment Violet 3**	*add*	**Sicilian Purple X-1467 ... ... IMP**
		add	**Violet Toner X-1387, X-2698 ... ... IMP**
2765	**C.I. Pigment Violet 5**		
	under "Aluminium lake"	*add*	**Morocco Maroon X-1550 ... ... IMP**
		add	**Suez Maroon A-4373 ... ... IMP**
		delete	"The following brand is related" **Segnale Light Amaranth 5B ... ... Acna**
	C.I. Pigment Violet 6		
	under "Aluminium lake"	*add*	**Segnale Light Amaranth 5B ... ... Acna**
2769	**C.I. Pigment Blue 1**	*add*	**Halopont Blue BGM ... ... DuP**
		add	**Marine Blue A-8021 ... ... IMP**
		add	**Sicilian Blue A-7021, X-2758 ... ... IMP**
2770	**C.I. Pigment Blue 3**	*add*	**Danube Blue A-4382 ... ... IMP**
2773	**C.I. Pigment Blue 15**	*add*	**Franconia Blue A-4431 ... ... IMP**
		add	**Monarch Blue Toner X-2303, X-2763... IMP**
		add	**Monarch Blue Toner NC X-2371 ... IMP**
		add	**Monarch Blue NCNF X-2658 ... ... IMP**
		add	**Monarch Blue Toner NCNF X-2810 ... IMP**
		delete	**Monastral Fast Blue BFP ... ... DuP**
		add	**Monastral Fast Blue BB, BFR, BGWD, BNF ... ... DuP**
	C.I. Pigment Blue 16	*add*	**Monarch Blue G X-2480 ... ... IMP**
2776	**C.I. Pigment Blue 24**	*add*	**Peacock Blue X-1756 ... ... IMP**
2777	**C.I. Pigment Blue 27**	*add*	**C.P. Iron Blue all types ... ... IMP**
2781	**C.I. Pigment Green 1**	*add*	**Avon Green A-4379 ... ... IMP**
2782	**C.I. Pigment Green 4**	*add*	**Bronze Green Toner A-8002 ... ... IMP**
2783	**C.I. Pigment Green 7**	*delete*	**Monastral Fast Green GFP ... ... DuP**
		add	**Monastral Fast Green GFG, GFN, GH, 2GWD, GX, GXB ... ... DuP**
		add	**Sherwood Green A-4436 ... ... IMP**
	C.I. Pigment Green 8	*add*	**Chippewa Green X-1291 ... ... IMP**
2786	**C.I. Pigment Green 15**	*add*	**Sylvan Greens ... ... IMP**
		add	**Vale Greens ... ... IMP**
		add	**Velvet Greens ... ... IMP**
2787	**C.I. Pigment Green 17**	*add*	**Chromium Oxide X-1134 ... ... IMP**
	C.I. Pigment Green 18	*add*	**Permanent Green X-1010 ... ... IMP**
		add	**Permanent Green X-1483 ... ... IMP**
2817	**C.I. Solvent Yellow 2**	*add*	**Enial Yellow 2G ... ... Enia**
2818	**C.I. Solvent Yellow 5**	*add*	**Ext.D&C Yellow No. 9 ... ... AAP, CCC, DC, KO, NAC, WJ**

Page	*Colour Index Designation*		
2819	**C.I. Solvent Yellow 6**	*add*	**Ext.D&C Yellow No. 10 ... ... AAP, CCC, DC, KO, NAC, WJ**
2821	**C.I. Solvent Yellow 14**	*add*	**Enial Orange I ... ... Enia**
		add	**Oil Orange 2B ... ... NAC**
2831	**C.I. Solvent Yellow 47**	*add*	**Luxol Fast Yellow TN ... ... DuP**
2835	**C.I. Solvent Orange 7**	*add*	**Resin Scarlet 2R ... ... NAC**
2850	**C.I. Solvent Red 23**	*add*	**Oil Red 3G ... ... NAC**
	C.I. Solvent Red 24	*add*	**Enial Red IV ... ... Enia**
2883	**C.I. Solvent Blue 37**	*add*	**Luxol Fast Blue ARN ... ... DuP**
		add	**Spirit Soluble Fast Blue R ... ... NAC**
	C.I. Solvent Blue 38	*add*	**Spirit Soluble Fast Blue 6G ... ... NAC**
2914	**C.I. Fluorescent Brightening Agent 30**	*add*	**Delft White 2RW ... ... NCF**
		add	**Enianil White R ... ... Enia**
	C.I. Fluorescent Brightening Agent 32	*add*	**Delft White BS... ... ... NCF**
		add	**Enianil White B ... ... Enia**

VOLUME 3

Additions and Amendments

Page	*Colour Index No.*	
3033	for **12370**★	**Pigment**
	read **12370**	**C.I. Pigment Red 112**
3044	for **13220**★	**Direct Dye**
	read **13220**	**C.I. Direct Brown 191** (*Reddish brown*)
3116	for **19110**★	**Acid Dye**
	read **19110**	**C.I. Acid Yellow 122**
3151	for **22190**★	**Direct Orange** (*Bright reddish orange*)
	read **22190**	**C.I. Direct Orange 101** (new entry) (*Bright orange*)
3311	for **35785**★	**Direct Dye**
	read **35785**	**C.I. Direct Red 194**
3430	for **51305**★	**Direct Dye**
	read **51305**	**C.I. Direct Blue 190** (*Bright blue*)
3444	for **53150**★	**Sulphur Dye** (*Yellow*)
	read **53150**	**C.I. Sulphur Yellow 12** (*Yellow*)
3511	for **63610**★	**Acid Dye** (*Blue*)
	read **63610**	**C.I. Acid Blue 69** (*Blue*)
3563	for **73660**★	**Vat Dye**
	read **73660**	**C.I. Vat Black 35** (*Greenish grey-black*)
	under **73671**	
	for Soluble in water (bluish black)	
	read Soluble in water (pale yellow)	

add

3610

77201 **C.I. Pigment Orange 23** (new entry)
(*Yellowish orange→Reddish orange*)

C.I. Pigment Red 113 (new entry)
(*Yellowish red→Bordeaux*)

Cadmium sulfide–mercuric sulfide CdS.*x*HgS obtained by co-precipitation of the sulfides and then calcining. The hue becomes redder and deeper the greater the HgS content

Patents (*Manufacture*)
BP 815328. Johnson, Matthey & Co.
USP 2878134. Imperial Color Chemical & Paper Corp.

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add

3611

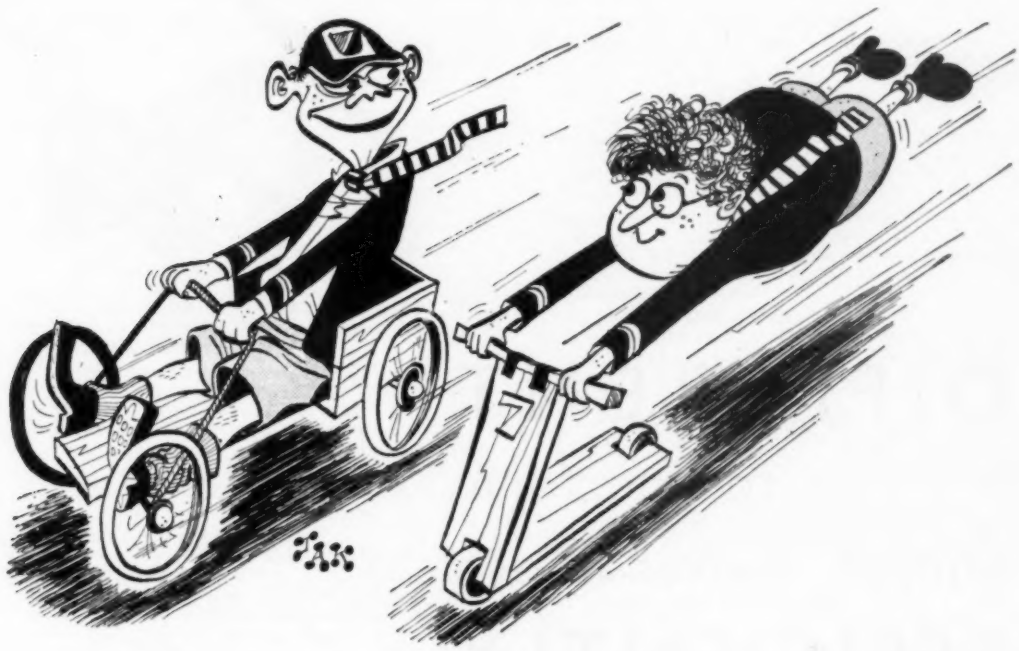
77230 **C.I. Pigment White 28** (new entry)
Calcium silicate

VOLUME 4

Amendments

IBA IBA have ceased to be manufacturers of dyes and therefore all dyes made by them are to be deleted.

Page			
4002		*delete*	IBA Fabrica Inbra, Industria Brasileira de Anilinas S.A., São Paulo, Brazil
4002	The entry for IMP should read—		IMP Imperial Color Chemical & Paper Corp., Glens Falls, N.Y., U.S.A.
4003	The entry for NAC should read—		NAC National Aniline Div., Allied Chemical Corp., New York 6, N.Y., U.S.A.
4006		*delete*	Fabrica Inbra, Industria Brasileira de Anilinas S.A., São Paulo, Brazil (IBA)
4007		for	Imperial Paper & Color Corporation, Glen Falls, N.Y., U.S.A. (IMP)
		read	Imperial Color Chemical & Paper Corp., Glens Falls, N.Y., U.S.A. (IMP)
4007		for	National Aniline Div., Allied Chemical & Dye Corp., New York, N.Y., U.S.A.
		read	National Aniline Div., Allied Chemical Corp., New York 6, N.Y., U.S.A.
4392		for	Perlamin ... ... Vond
		read	Pernilan ... ... Vond and transfer to p. 4394



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FORTHCOMING MEETINGS OF THE SOCIETY

Tuesday, 17th November 1959

BRADFORD JUNIOR BRANCH. *An Investigation into the Application of Logwood to Dicel and Nylon Fabrics.* E. France, Esq. (Courtaulds Ltd.). Institute of Technology, **Bradford.** 7.15 p.m.

SCOTTISH SECTION. *The Finishing of Fabrics containing Short Staple Terylene.* D. Clegg, Esq., M.Sc., A.T.I. (Imperial Chemical Industries Ltd.). St. Enoch Hotel, **Glasgow.** 7.15 p.m.

HUDDERSFIELD SECTION. *Recent Developments in Wool Dyeing.* D. G. Evans, Esq., B.Sc. (CIBA Clayton Ltd.). Silvios Cafe, Westgate, **Huddersfield.** 7.30 p.m.

Wednesday, 18th November 1959

MIDLANDS SECTION. *Identification of Dispersed Dyes.* W. L. Lead, Esq., Ph.D., F.R.I.C., D. Haig, Esq., F.T.I., F.S.D.C., L. A. Telesz, Esq., F.T.I. College of Technology, **Leicester.** 7 p.m.

Thursday, 26th November 1959

WEST RIDING SECTION. *The Principles of Colour Photography.* D. P. Ayres, Esq., B.Sc. (Ilford Ltd.). Griffin Hotel, Boar Lane, **Leeds 1.** 7.30 p.m.

Thursday, 3rd December 1959

WEST OF ENGLAND AND SOUTH WALES SECTION. *The Printing of Synthetic Fibres.* R. E. Fletcher, Esq. Park Hotel, **Cardiff.** 6.30 p.m. for 7.15 p.m.

Friday, 4th December 1959

LONDON SECTION. Short Papers by London Section Members. *Dyeing of Ribbons.* R. C. Oakley, Esq. and *Dyeing of Carpet Yarns.* R. Woods, Esq., F.S.D.C. Royal Society, Burlington House, **London W.1.** 6 p.m.

Tuesday, 8th December 1959

SCOTTISH JUNIOR BRANCH. *Heat Setting.* J. A. Bamber, Esq. (British Rayon Research Association). Technical College, **Paisley.** 7.30 p.m.

Wednesday, 9th December 1959

BRADFORD JUNIOR BRANCH. Annual Dance. Betty's Cafe, **Bradford.**

Thursday, 10th December 1959

WEST RIDING SECTION. *The Kinetics of Wool Dyeing with 2,1 Metal Complexes.* Dr. H. Ackermann (Geigy, Basle). Victoria Hotel, Bridge Street, **Bradford 1.** 7.30 p.m.

MANCHESTER JUNIOR BRANCH. *Modern Techniques in Vat Dyeing.* L. Boardman, Esq., A.R.C.T., Room J/B 16, Chemical Engineering Building (Jackson Street), College of Science and Technology, **Manchester.** 4.30 p.m.

Tuesday, 15th December 1959

HUDDERSFIELD SECTION. *The Colouring of Tufted Carpet in Piece Form.* R. C. Cheetham Esq., G. W. Lewis, Esq. and Dr. J. Waller. (Courtaulds Ltd., Droylsden). Silvios Cafe, Westgate, **Huddersfield.** 7.30 p.m.

SCOTTISH SECTION. *The Principles of Colour Photography.* Dr. C. H. Giles (on behalf of Ilford Ltd.). St. Enoch Hotel, **Glasgow.** 7.15 p.m.

NORTHERN IRELAND SECTION. *The Mechanism of Dyeing with Procion Dyes.* H. H. Sumner, Esq., B.Sc. (Imperial Chemical Industries Ltd.). Grosvenor Rooms, **Belfast.** 7.30 p.m.

Wednesday, 16th December 1959

BRADFORD JUNIOR BRANCH. *Recent Developments in Wool Dyeing.* D. G. Evans, Esq. (CIBA Clayton Ltd.) Institute of Technology, **Bradford.** 7.15 p.m.

MIDLANDS SECTION. *Acrylics in Knitwear.* Half Day Symposium. J. F. Gaunt, Esq., Ph.D., F.R.I.C., F.T.I., H. D. Edwards, Esq., Ph.D., A.R.I.C., J. Rayment, Esq., A.T.I. College of Technology, **Loughborough.** 2.30 p.m. and 7 p.m.

January 1960

SCOTTISH JUNIOR BRANCH. The date and title of this lecture is to be arranged.

Friday, 8th January 1960

LONDON SECTION. *New Works on the Dyeing of Nylon with Disperse Dyes.* H. W. Seaman, Esq., B.A. (I.C.I. Ltd.). Royal Society, Burlington House, **London W.1.** 6 p.m.

Tuesday, 12th January 1960

NORTHERN IRELAND SECTION. *Radio-isotopes and Their Industrial Applications.* R. J. Magee, Esq., M.Sc., Ph.D., M.R.S.A., A.R.I.C. (Queen's University, Belfast). Grosvenor Rooms, **Belfast.** 7.30 p.m.

Thursday, 14th January 1960

WEST RIDING SECTION. *Experience gained in the Dyeing and Finishing of Polyester/Wool Fabrics in Germany.* Dr. J. Nusslein (Farbwerke Hoechst). Victoria Hotel, Bridge Street, **Bradford 1.** 7.30 p.m.

MANCHESTER JUNIOR BRANCH. *A Survey of Modern Textile Finishing.* G. Landells, Esq., B.Sc., Ph.D., A.R.I.C., F.S.D.C. Room J/B 16, Chemical Engineering Building (Jackson Street), College of Science and Technology, **Manchester.** 4.30 p.m.

Monday, 18th January 1960

BRADFORD JUNIOR BRANCH. *Problems in the dyeing of Wool, Fibro and Terylene for blending.* Miss Esmée Smith (Wm. Smith & Co. Ltd.) Institute of Technology, **Bradford.** 7.15 p.m.

Tuesday, 19th January 1960

MIDLANDS SECTION. *Beam Dyeing.* (Paper written by Burlington Corp. U.S.A.) K. S. Laurie, Esq. A.M.I.Mech.E., A.M.I.E.E. Gas Theatre, **Nottingham.** 7 p.m.

HUDDERSFIELD SECTION. *Problems in Dyeing Polyester Fibres and Means of Overcoming Them.* Dr. J. Nusslein (Farbwerke Hoechst A.G.). Silvios Cafe, Westgate, **Huddersfield.** 7.30 p.m.

Friday, 22nd January 1960

WEST RIDING SECTION. Annual Dinner and Dance.

SCOTTISH SECTION. *Some Problems on the Dyeing and Finishing of Fabrics using the Newer Synthetics from the point of view of the customer.* J. S. Ingham, Esq., M.Sc., F.R.I.C. (Marks & Spencer Ltd.). St. Enoch Hotel, **Glasgow.** 7.15 p.m.

Thursday, 28th January 1960

WEST RIDING SECTION. *Levelling Agents for Wool Dyeing.* Dr. J. Lanter (CIBA, Basle). Victoria Hotel, Bridge Street, **Bradford 1.** 7.30 p.m.

Friday, 29th January 1960

HUDDERSFIELD SECTION. Annual Dinner. Princess Cafe, **Huddersfield.**

Saturday, 30th January 1960

MANCHESTER SECTION. Annual Dinner and Dance. Grand Hotel, **Manchester.** 6 p.m. for 6.30 p.m.

Monday, 1st February 1960

HUDDERSFIELD SECTION. *Choice of an Artificial Daylight for Colour Matching with Special Reference to Fluorescent Materials.* F. L. Warburton, Esq., M.Sc., A.R.C.S., D.I.C., A.Inst.P. (Wool Industries Research Association). (Joint meeting with Huddersfield Textile Society.) Large Hall, College of Technology, **Huddersfield.** 7.30 p.m.

Tuesday, 2nd February 1960

NORTHERN IRELAND SECTION. *Professional Salesmanship—The Key to Prosperity.* A. B. M. Taylor, Esq. (Irish Linen Guild). (Joint meeting with Textile Institute.) York Street Flax Spinning Co. Ltd., Henry Street, **Belfast.** 7.30 p.m.

Friday, 5th February 1960

LONDON SECTION. *Dyeing and Finishing of 'Courtolon' Nylon in relation to its Yarn Properties.* L. Cotton, Esq., B.A., and J. Wardle, Esq. (Courtaulds Ltd.). Royal Society, Burlington House, **London W.1.** 6 p.m.

Tuesday, 9th February 1960

NORTHERN IRELAND SECTION. *Problems Relating to Permanent Finishes.* Dr. A. Schurch (CIBA Ltd., Basle). Grosvenor Rooms, **Belfast.** 7.30 p.m.

Wednesday, 10th February 1960

MIDLANDS SECTION. *Dyeing and Finishing of Courtolon Yarns, Fabrics and Garments.* J. Wardle, Esq., L. Cotton, Esq., B.Sc. College of Technology, **Leicester.** 7 p.m.

Thursday, 11th February 1960

WEST RIDING SECTION. *Paper Chromatography of Dyestuffs.* J. C. Brown, Esq. (CIBA Clayton Ltd.). Griffin Hotel, Boar Lane, **Leeds 1.** 7.30 p.m.

continued on page iv

FORTHCOMING MEETINGS OF THE SOCIETY — *continued from page* iii

Thursday, 11th February 1960

MANCHESTER JUNIOR BRANCH. *The Photo-chemistry of Aromatic Molecules and Dyestuffs.* Professor G. Porter, M.A., Ph.D., F.R.I.C., Room J/B 16, Chemical Engineering Building (Jackson Street), College of Science and Technology, **Manchester.** 4.30 p.m.

SCOTTISH SECTION *Recent Developments in Wool Dyeing.* W. Beal, Esq., B.Sc. (Geigy Co. Ltd.). (By invitation of the Textile Institute.) Scottish Woollen Technical College, **Galashiels.** 7.30 p.m.

SCOTTISH JUNIOR BRANCH. *Problems relating to Permanent Finishes.* Dr. A. Schurch (CIBA Clayton Ltd.). Technical College, George Street, **Paisley.** 7.30 p.m.

Friday, 12th February 1960

LONDON SECTION. Annual Dinner and Dance. Waldorf Hotel, **London W.C.2.** 7 p.m. for 7.30 p.m.

Tuesday, 16th February 1960

BRADFORD JUNIOR BRANCH. *Developments in the Manufacture and finishing of Terylene–Wool Fabrics.* J. B. Timis Esq. (I.C.I. Ltd.). Institute of Technology, **Bradford.** 7.15 p.m.

SCOTTISH SECTION. *The Keratin of Wool.* Professor J. B. Speakman, D.Sc., F.R.I.C., F.T.I. (Joint meeting with the Textile Institute.) The Royal College of Science and Technology, **Glasgow.** 7.30 p.m.

Tuesday, 23rd February 1960

SCOTTISH SECTION. *Some observations on the Production of Dyed Yarn for Carpets.* G. B. Angus, Esq., B.Sc., A.R.I.C., A.M.I.I.A., F.S.D.C. (J. Crossley & Sons). St. Enoch Hotel, **Glasgow.** 7.15 p.m.

Thursday, 25th February 1960

WEST RIDING SECTION. *New Work on the Dyeing of Nylon with Disperse Dyes.* H. Seaman, Esq., (I.C.I. Ltd.). Victoria Hotel, Bridge Street, **Bradford 1.** 7.30 p.m.

Friday, 4th March 1960

LONDON SECTION. *Recent Developments in Leather Dyeing.* J. H. Sharphouse, Esq. (Northampton College of Technology). Royal Society, Burlington House, **London W.1.** 6 p.m.

Tuesday, 8th March 1960

NORTHERN IRELAND SECTION. *The Dyeing and Finishing of Fabrics Containing Tricel.* R. J. Mann, Esq., B.Sc., F.S.D.C. (Courtaulds Ltd.). Grosvenor Rooms, **Belfast.** 7.30 p.m.

HUDDERSFIELD SECTION. *Paper Chromatography of Dyestuffs.* J. C. Brown, Esq., B.Sc., A.R.I.C. (CIBA Clayton Ltd.). (Joint meeting with the Huddersfield Section of the Royal Institute of Chemistry.) Silvios Cafe, Westgate, **Huddersfield.** 7.30 p.m.

Thursday, 10th March 1960

MANCHESTER JUNIOR BRANCH. Short Papers by members of the Section. Room J/B 16, Chemical Engineering Building (Jackson Street), College of Science and Technology, **Manchester.** 4.30 p.m.

MIDLANDS SECTION. *The Dyeing of Ribbons.* E. Bridge, Esq. (Joint meeting with the Coventry Textile Society.) Courtaulds Acetate and Synthetic Fibres Laboratory, **Coventry.** 7.30 p.m.

Thursday, 10th March 1960

WEST RIDING SECTION. *A comparison of the Dyeing of Acrylics and Worsted Hosiery Yarns.* Dr. J. F. Gaunt (Patons and Baldwins Ltd.). Victoria Hotel, Bridge Street, **Bradford 1.** 7.30 p.m.

Tuesday, 15th March 1960

SCOTTISH SECTION. Annual General Meeting 7 p.m. Followed by *Paper Chromatography of Dyestuffs.* J. C. Brown, Esq. (CIBA Clayton Ltd.) St. Enoch Hotel, **Glasgow.** 7.30 p.m.

Wednesday, 16th March 1960

BRADFORD JUNIOR BRANCH. *The Development of a new Shrink-resist Finish from the laboratory to the Mill.* A. N. Davidson, Esq. (Wool Industries Research Association). Institute of Technology, **Bradford.** 7.15 p.m.

MIDLANDS SECTION. *Thermal Setting of Tricel.* W. F. Kilby, Esq., B.Sc., A.Inst.P. (Joint meeting with B.A.O.C.) Midland Hotel, **Derby.** 7 p.m.

SCOTTISH JUNIOR BRANCH. Annual General Meeting, 7.0 p.m., followed by a lecture *Paper Chromatography of Dyestuffs.* J. C. Brown, Esq. (CIBA Clayton Ltd.). Technical College, George Street, **Paisley.** 7.30 p.m.

Friday, 18th March 1960

MIDLANDS SECTION. Annual Dinner. George Hotel, **Nottingham.** 7 p.m.

Thursday, 24th March 1960

WEST RIDING SECTION. Annual General Meeting followed by *Problems involved in Piece Dyeing with Vat Dyestuffs.* M. Brauer, Esq. (Badische Anilin & Soda Fabrik A.G.). Victoria Hotel, Bridge Street, **Bradford 1.** 7.30 p.m.

Friday, 25th March 1960

LONDON SECTION. *The Origin of Faults in the Dyeing of Textiles.* N. Jackson, Esq. (Courtaulds Ltd.). George Hotel, **Luton.** 7 p.m.

Thursday, 7th April 1960

MIDLANDS SECTION. *Recent Developments in Dyeing Wool.* D. B. Evans, Esq. (Joint meeting with the Textile Institute.) Carpet Trades Ltd., Canteen, **Kidderminster.** 7.30 p.m.

Tuesday, 12th April 1960

SCOTTISH SECTION. *Ladies Evening.* (Details to be announced later.)

Wednesday, 13th April 1960

MIDLANDS SECTION. Annual General Meeting. *Colour Photography.* D. P. Ayres, Esq., B.Sc., A.R.P.S. College of Technology, **Leicester.** 7 p.m.

Thursday, 14th April 1960

MANCHESTER JUNIOR BRANCH. Annual General Meeting. Title of paper to be announced later. T. Vickerstaff, Esq., M.Sc., Ph.D., F.S.D.C., Room J/B 16, Chemical Engineering Building (Jackson Street), College of Science and Technology, **Manchester.** 4.30 p.m.

Tuesday, 19th April 1960

HUDDERSFIELD SECTION. Annual General Meeting. Followed by a lecture *How Colour Photography Works.* D. P. Ayres, Esq., B.Sc. (Ilford Ltd.). Silvios Cafe, Westgate, **Huddersfield.** 7.30 p.m.

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The Society is urgently wanting Journals (in good condition) for February, March, April, May and June 1959

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NOTICE TO MEMBERS AND SUBSCRIBERS

Readers requiring *general information* regarding the Official Notices, List of Officers of the Society, etc, should consult pages 1–10 of the January 1959 and pages 341–348 of the July 1959 issues of the *Journal*, or write to *The General Secretary*, The Society of Dyers and Colourists, Dean House, 19 Piccadilly, Bradford 1, Yorkshire (*Telephone* Bradford 25138). *Editorial Communications* should be addressed to *The Editor*, at the same address

Forthcoming Papers

The following papers have been accepted by the Publications Committee, and will appear in future issues of the *Journal*—

LECTURES

The Solubility of Wool Dyes. Its Assessment and Practical Significance — *W. Beal*

The Remazol Linkage — *E. Bohnert*

Vat Dyeing of Cotton Piece Goods by Pigmentation Routes — *M. R. Fox and J. F. Mawson*

New Ideas in the Application of Phthalocyanine Derivatives to Textiles — *F. Gund*

Some Recent Advances in Textile Printing — *R. J. Hannay*

Tests for Colour Vision — *F. Jordinson and T. Minshall*

Some Relations between the Chemical Constitution of Cibacron Dyes and their Dyeing Characteristics — *J. Wegmann*

COMMUNICATIONS

The Dyeing of Cellulose Acetate with Disperse Dyes

VIII— Determination of Fibre Saturation Values — *C. L. Bird, H. K. Partovi, and G. Tabbron*

Studies on Haematoxylin and Haematein, the Colouring Principles of Logwood

I— Absorption Spectra of Pure Compounds in Various Solvents and a Spectrophotometric Method of Analysis for Haematoxylin and Haematein

II— Behaviour in Aqueous Solution at Varying pH and p*K* Values — *G. C. Lalor and S. L. Martin*

Optical Studies

I— Relation of Shade to Apparent Soilability of Textile Materials

II— SMR Values for a Comprehensive Range of Shades — *H. B. Mann and T. H. Morton*

How Much Research? A Critical Problem in the Manufacture of Textile Dyes — *G. S. J. White*

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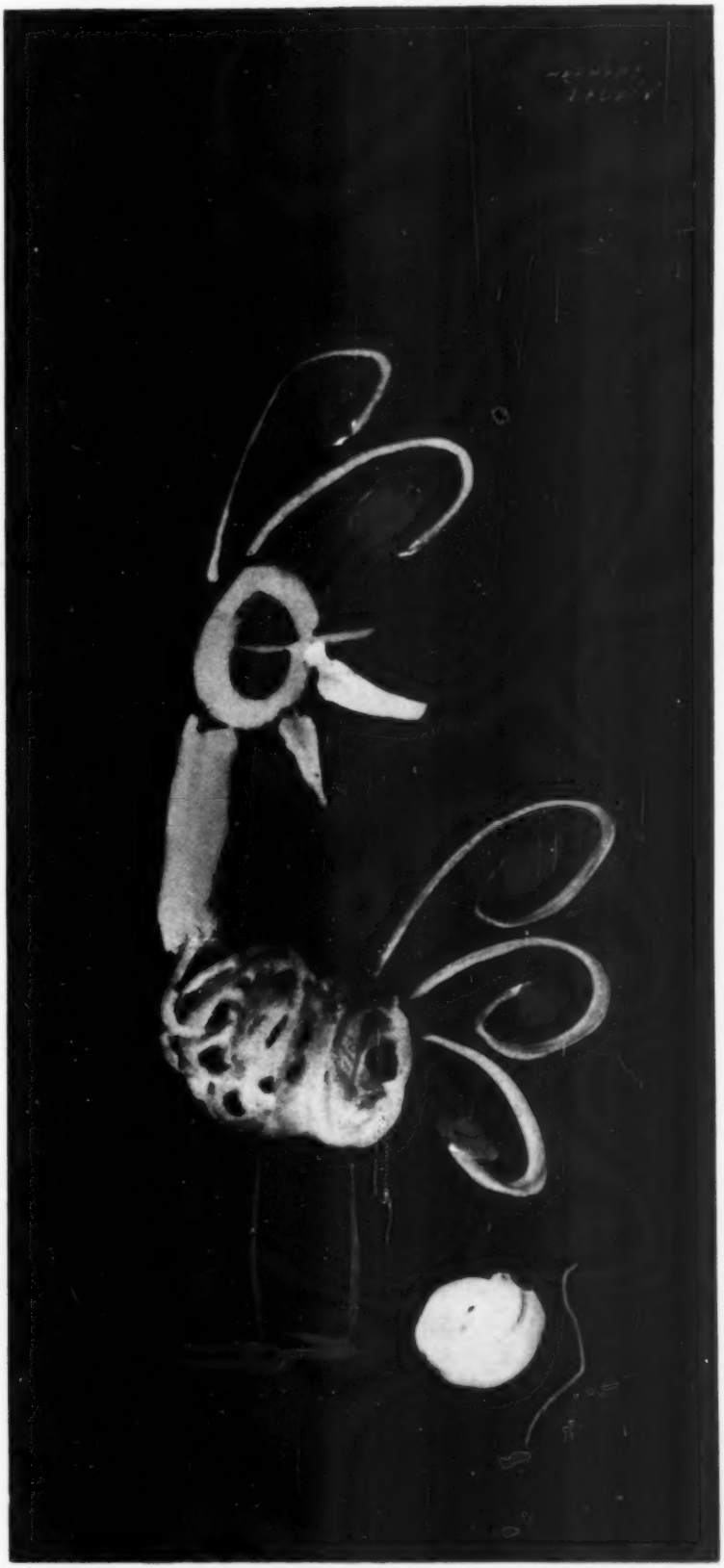

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THE JOURNAL

OF THE

Society of Dyers and Colourists

Volume 75 Number 10 OCTOBER 1959* *Issued Monthly*

Proceedings of the Society

Jigger Studies

I—The Watering of Acetate Poult Fabrics Cause and Prevention

E. FRANCE

Meeting of the West Riding Section held at the Victoria Hotel, Bradford, on 12th December 1957, Mr. G. E. Styan in the chair

The watering of secondary cellulose acetate taffetas and poults in jigger processing is shown to occur during the first wetting-out run. The phenomena observed are related to the properties of the fabric and the physics of the roll. Practical methods of producing fabrics free from watering are discussed, and one, entailing a slight modification of normal jigger processing, is recommended.

1. INTRODUCTION

The desirable properties of textile fabrics can be roughly classified into two groups: those concerned with functional performance and those pertaining to aesthetic appeal. Although recently particular attention has been directed to performance in wash and wear, pleasing appearance and satisfactory handle continue to be the basic qualities of a successful commercial fabric.

The number of publications on the mechanism of dyeing processes and the liberal supply of information offered by dye manufacturers provide ample evidence of the importance of coloration. Much less attention has been given to the attainment of a uniform physical finish. An excellently dyed fabric may still have an undesired irregular appearance due to a difference in the physical state of adjacent areas of fabric. The fault known as *watering* is a particularly good example of the way in which a uniformly dyed fabric loses some of its attractiveness in this manner.

Watering resembles moiréing; watering can be considered as an undesirable unevenness whose location and intensity over the fabric surface occur in a random manner, whereas in the moiré process an attempt is made to control both the shape and the extent of the areas of different appearance.

2. DESCRIPTION OF WATERING AND SOME PREVIOUS EXPLANATIONS OF ITS ORIGIN

The fault of watering is most frequently encountered in densely constructed cellulose acetate fabrics woven from low-twist continuous-filament yarns, e.g. linings, taffetas, grosgrains, and some satins. The development of the characteristic handle and appearance associated with the above types of fabric necessitates their treatment on open-width dyeing machines, as does their proneness to form sharp creases rather than rounded folds. Since the fault involves an irreversible deformation of the fabric, it can rarely be corrected.

The attractiveness of these usually high-quality fabrics dyed and finished on the jigger is often impaired by the appearance of diffuse areas which reflect light differently. These areas, which shimmer or glisten to a varying degree, vary in size and contour. Sometimes they appear as closely grouped, slightly irregular waves, running from selvedge to selvedge; whereas in severe cases of watering the fault forms a blurred extended dumb-bell shape stretching along the length of the fabric.

The diffuse appearance of watering makes precise examination of this fault tedious and difficult. It may be that this lack of precision in both the shape and the severity of watering has been responsible for the varied suggestions made from time to time to explain the origin and cause of this fault. The following explanations illustrate the diversity of technical opinion that exists—

(i) Formation of tight compact rolls of grey fabric during the running-up of the dry fabric.

(ii) Use of excessive tension and solutions at too high a temperature during jigger treatment.

(iii) Prolonged standing of the wet dyed rolls of fabric prior to drying.

* Published November 1959

(iv) Prolonged and severe hydroextraction of the fabric in roll form.

(v) Application of too much tension during the final drying.

(vi) Excessive pressure during prolonged storage of the grey fabric.

From the above it will be seen that there is no agreed opinion as to the mechanism of watering; but the application of undue tension or pressure to the fabric in roll form is the basis of most of the explanations advanced.

A close examination of a defective watered fabric indicates that the differences in appearance are due to local flattening of knuckles and ridges of the weave, as in moiréing. It is interesting that the earliest known application of the microscope to a textile question was concerned with this same problem. Hooke[1] showed that watering or moiréing occurred when two fabrics were heavily pressed together: in places the knuckles or ridges coincided, and flattening occurred; in other places the knuckles and ridges coincided with spaces and valleys, so that pressure caused less change in appearance. We are thus reasonably certain that the watering is due to pressure on the fabric at some stage in the process.

Most of the observations which led to the location of the origin of the fault, and succeeding work on its rectification, were conducted on 400-yd. (8-piece) batches of a secondary cellulose acetate poult (75-denier warp, 200-denier weft) both scoured and dyed on the jigger.

3. A GENERAL OBSERVATION AND A HYPOTHESIS ON WATERING

Frequently, the solution of a textile problem depends first on a specific or generalised observation, followed by the formulation of a hypothesis, support of which is then sought by carefully designed experiment. The following account shows that the early work on watering conforms to this pattern.

During an investigation of a problem unrelated to watering it was necessary to examine in great detail upwards of 30,000 yd. of an acetate poult fabric. It was during this work that an important observation was made. Although the intensity of watering varied from batch to batch, almost every batch contained 30–50 yd. of fabric stitched adjacent to a wrapper which was more severely watered than the remainder of the roll. In Tables Ia and Ib an analysis of the results on 30 batches is given. By marking the fabric prior to processing it was established that the severely affected part of each roll of fabric was always associated with the first end wetted-out on the jigger.

Particular attention was focused on areas adjacent to the bar of disturbed structure associated with a starting place in weaving. It was well established that imprints identical in contour to the well defined watering which develops at loom starting places were always formed at two places on opposite faces of the fabric at distances equal to the circumference of the roll from the starting place. The geometry of the "master" water marks and their related imprints is shown in Fig. 1. From a detailed consideration of the location of the imprints it was apparent that watering had always occurred during an odd-numbered run.

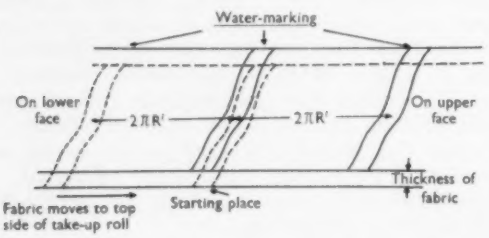

FIG. 1— Geometry of Marking-off (schematic)

TABLE I

Analysis of 30 Batches of Black Acetate Poult for Pieces downgraded for Watering

A— OVERALL ANALYSIS

No. of Batches	Pieces in Batch	
	Standard Grade	Substandard Grade
9	8	0
13	7	1
5	8	2
3	4	4
Proportion of total pieces, %	85·4	14·6

B— ANALYSIS OF POSITION OF SUBSTANDARD PIECES IN ROLL

Grade	Position, counting from end first entered							
	1	2	3	4	5	6	7	8
Standard	9	22	27	27	30	30	30	30
Substandard	21	8	3	3	0	0	0	0

With the exception of the first run on the jigger, there is no evidence that a characteristic difference in roll pressure exists between any even-numbered or odd-numbered runs. Therefore it seemed quite reasonable that water-marking had occurred during a run in which conditions were quite different from all other runs, viz. wetting-out and relaxation during the first run.

These observations permit the hypothesis that, on wetting-out, a fabric begins to release its inherent strains. The accompanying contraction (or extension) of the fabric does not, however, occur instantaneously: the dimensional changes a fabric undergoes on wetting-out take place over a finite interval of time. The process of relaxation may subject the fabric to tension, which is additional to any tension imposed on the fabric either by braking or by friction in the jigger headstock. Any material which is lapped in a state of tension round a cylindrical surface exerts a pressure which is directed towards the centre of the cylinder. Since each layer makes its own contribution to the final pressure, those layers next to the rigid jigger beam will be subject to a higher pressure than those forming the centre or outside of the roll of cloth. This greater pressure, which is exerted on layers of fabric near to the jigger roller, explains why the first 30–50 yd. of each roll of fabric is more severely watered than the remainder of each batch.

This hypothesis is strongly supported by the character of the watering. The marking-off of starting places is well defined, and the watering

very clear. An examination of several hundred such places leaves the very strong impression that the pressure which has caused the defect has been applied once only, since repeated application could not be expected to bring the fabrics into precisely the same apposition (within one end and pick) in successive runs.

Finally, it is a matter of common observation that with acetate fabrics wet rolls are much harder— apparently tighter— in the first run than in any succeeding run.

4. SUPPORTING DATA

The hypothesis of watering advanced here can be maintained only if we can demonstrate that high normal pressures are possible near the jigger beam, and also that the fabric which is the subject of the processing experiments can generate the requisite tensions.

4.1 A single layer of fabric wound on to a drum of radius r in. at a tension T lb./in. width will exert a normal pressure p lb./in.^{2} on the drum—

$$p = \frac{T}{r} \qquad \text{(i)}$$

If now we wind many layers of the fabric (of thickness d in.) on to the drum at tension T, so that the final radius of the roll is R in., the normal pressure exerted at the lowest layer of fabric is—assuming no relaxation of tensions by compression of the roll— the sum of the pressures exerted by all the N layers (P lb./in.^{2})—

$$P = \sum_{n} p$$

$$= \sum_{1}^{N} \frac{T}{r + nd}$$

$$= T \sum_{1}^{\frac{R-r}{d}} \frac{1}{r + nd} \qquad \text{(ii)}$$

Since N is a large integer, the summation (ii) may be equated without significant error to the infinitesimal form (iii)—

$$P = T \int_{0}^{\frac{R-r}{d}} \frac{1}{r + nd} \cdot dn \qquad \text{(iii)}$$

Standard integration gives—

$$P = \frac{T}{d} \left[\ln (r + nd) \right]_{0}^{\frac{R-r}{d}}$$

or—

$$P = \frac{2{\cdot}3T}{d} \log \frac{R}{r} \qquad \text{(iv)}$$

Calculated results are given in Table II for the acetate poult fabric. The normal jigger roller has usually a diameter of 6 in. ($r = 3$); a winding tension of a little over 0·4 lb./in. width is sufficient to produce a pressure at the lowest fabric layer of 40 lb./in.^{2}.

Similar reasoning, again assuming incompressibility of the roll, gives the pressure at any radius R_1 intermediate between r and R—

$$P_{R_1} = \frac{2{\cdot}3T}{d} \log \frac{R}{R_1} \qquad \text{(v)}$$

We have therefore established that high normal pressures can exist between layers of fabric in the jigger roll, and have shown that the maximum pressure occurs at the location of maximum observed watering.

TABLE II

Pressures at the Centre of a Roll of Acetate Poult Fabric

(l = 400 yd. Wet thickness d = 0·011 in.)

r (in.)	R (in.)	R/r	$\frac{P}{T}$ in.$^{-1}$
3	7·8	2·60	87
5	8·7	1·74	51
7	10·0	1·43	33
9	11·5	1·28	23

4.2 Cooper and Wilson[2] have carried out a detailed investigation into the mechanical properties of an acetate poult fabric whose proneness to watering is shown by the data of Table I. Two experiments are particularly relevant to the problem of watering—

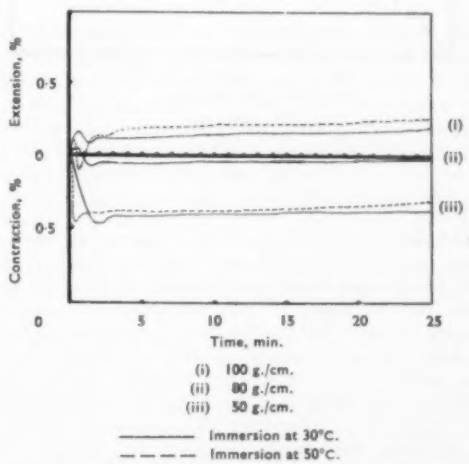

FIG. 2— Length Change of Cellulose Acetate Poult on Wetting at Indicated Temperatures and Loadings

In the first experiment strips of fabric 3 cm. wide were loaded under different tensions, and their dimensional changes recorded after immersing in dilute Teepol (Shell) solution at various temperatures. Several points emerge from an inspection of the results, of which a selection at 30° and 50°C. are shown in Fig. 2. The small variations in length which occur in the first few minutes after wetting-out repeat too accurately to be due to experimental error. They illustrate the complexity of the force system which results from the interactions of applied tension, the radial swelling of both warp and weft threads, and the release of yarn strains. The tension required to prevent completely the relaxation of the fabric during

wetting out is ca. 80 g./cm. (0·45 lb./in.). This force represents the tension which the fabric would generate when wetted-out at constant dimensions. Curves for immersion at zero load show that 80% of the total contraction occurs approx. 6 times as rapidly at 50° as at 30°C. It follows, therefore, that during jigger treatment high temperature of wetting out is preferable, since it promotes the quick release of internal strains before the fabric passes on to the roll, and so prevents the generation of large pressures on the inside layers.

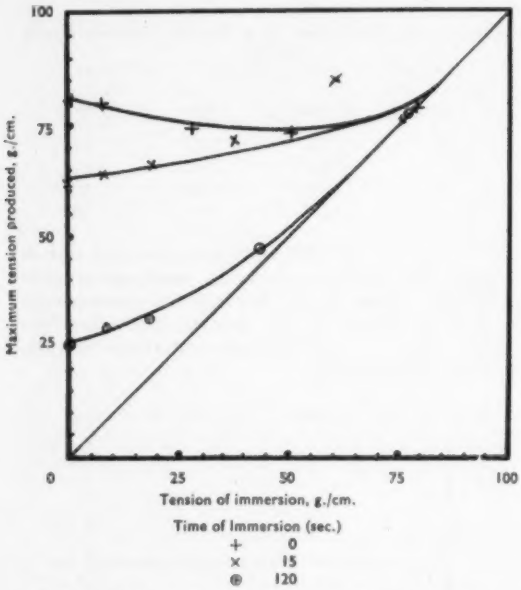

FIG. 3—Maximum Tension at Constant Extension (at 20°C.)

The change in tension which a fabric undergoes when, after wetting-out for various times, it is kept at constant length, is particularly interesting, since the sequence of the operation is closely related to the treatment a fabric receives during its first run on a jigger. Strips of fabric 1 cm. wide were loaded at a fixed tension, wetted-out at 20°c., and their lengths allowed to change at this tension for a given time. The tension necessary to prevent any further change in length on continued immersion was followed on the Cambridge extensometer. Fig. 3 shows the maximum tensions generated in the fabric after preliminary immersion times of nil, 15 sec., and 2 min. The tension required to preserve the dimensions which a fabric assumes when it has been wetted-out for 15 sec. or less is not greatly influenced by the initial tension applied to the fabric during the wetting-out process. This means that the fabrics wetted-out for 15 sec. at 20°c. under low loads can still generate a contracting force of approx. 65–80 g./cm.

The advantage of a prolonged time of wetting-out is particularly pronounced at low tensioning loads. Nevertheless, even after wetting-out for 2 min. at 20°c. at zero tensioning load a tension of 25 g./cm. is necessary to prevent further contraction.

Cooper and Wilson have thus shown that the tendency of the acetate poult to contract on wetting can produce high tensions in the jigger roll; correspondingly high pressures will be generated at the centre. At this point observations of Farrow[3] should be recalled: he finds that on wetting an acetate filament yarn the tensile modulus first diminishes to a very low value and then again increases to a constant value still considerably lower than the dry tensile modulus. Cooper and Wilson have confirmed completely that the acetate poult fabric under consideration behaves in the same manner. Although these data refer only to the tensile behaviour of the acetate fibre and fabric, it is reasonable to suppose that the fibre has a maximum plasticity for a short time after immersion.

If application of pressure coincides with this stage of maximum plasticity, then watering is greatly facilitated. In our view it is likely that this phenomenon is a factor tending to produce noticeable watering in the first run.

5. PRELIMINARY EXPERIMENTS

Before embarking on an extensive investigation into the problem of watering, it was thought prudent first to examine the possibility of supporting the hypothesis by critical experiments. Three important preliminary trials, carried out on 400-yd. batches of fabric, are worthy of mention.

In the first trial the validity of the most widely held of all previous theories, viz. the danger of scouring and dyeing at high temperature under excessive tension, was checked. Secondary acetate fabrics may be dyed black in Hemasol AR paste (C.I. Natural Black 2) at an unusually low temperature. Throughout the scouring, dyeing, and chroming processes, the temperature of the solutions was kept at 110°F. and, furthermore, any sudden change in temperature was avoided by slowly cooling used solutions and gradually warming new solutions. By constant attention the operative was successful in running the jigger at a dangerously low fabric tension. Despite these precautions, an end piece of the finished fabric, viz. the one first wetted-out on the jigger, was severely watered.

In the second experiment an attempt was made to change the position of the severe watering from an end piece to the centre of the roll. The fabric was passed through an empty jigger until each beam was loaded with half a batch of dry fabric. The jigger was then filled with cold dilute Teepol solution, and the fabric wetted out, scoured, and dyed as usual. On examining the finished fabric, the two centre pieces were downgraded for severe watering, whereas the three pieces on either side, though slightly watered, were considered satisfactory.

Perhaps the most informative experiment was carried out in the third trial. It was thought desirable to establish whether watering produced during the first run on the jigger was intensified, or its contour modified, when the fabric was subjected to the more severe processing conditions of scouring and dyeing. A batch of fabric was

treated first in a cold solution of a wetting agent (Teepol), then in a cold solution of an enzyme, rinsed in cold water, suctioned, and finally dried. Watermarking on the unscoured fabric was readily detected. Facsimiles of the contour and frequency of the watermarking pattern present at the stitching places were made, and then 4-in. strips removed from each side of every stitching. The restitched fabric was thoroughly wetted-out and collected in a slack roll by passing through a hand-operated jigger running at ca. 1 yd./min. The relaxed fabric was then scoured and dyed in a normal manner. The shape and frequency of the watermarking present in the white fabric were clearly recognisable in the dyed fabric. No new interference pattern had superimposed itself on the original pattern of watermarks already noted near the stitching places in the white fabric. It therefore appears that, despite the superimposing of fabrics whose picks are out of phase, further watering does not occur during normal scouring and dyeing processes, provided that the fabric has previously been completely relaxed.

These preliminary experiments demonstrated the deleterious effect of batching fabrics before the fabric has completed its relaxation. From this evidence it was thought that the prevention or amelioration of watermarking depends on two possibilities—

(i) Achieving complete relaxation of the fabric in the wetting-out solution prior to batching the wet fabric in roll form; or—

(ii) Minimising the pressure between the layers of fabrics during jigger processing.

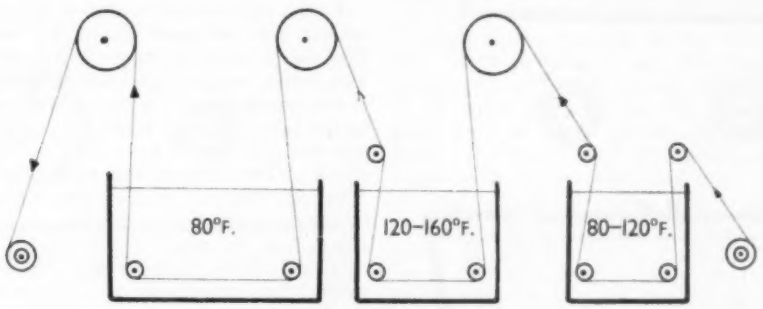

FIG. 4

6. PRACTICAL TRIALS DESIGNED TO PREVENT WATERING

6.1 In the first phase of the practical investigation attention was focused on a method of achieving complete relaxation of the fabric before it was processed in roll form. Batches (400 yd.) of an acetate poult fabric were relaxed in open width in a dilute Teepol solution at a temperature varying from 80° to 160°F. on a machine (Fig. 4) consisting of three tanks fitted with guide rollers. It was hoped by increasing the temperature of the wetting-out solution to achieve a rapid and complete relaxation in the 2 min. the fabric requires to travel from the let-off to the take-up beams. However, the long length of fabric (15–20 yd.) which is virtually under no positive control, together with the parchment-like rigidity of a wet poult fabric, created processing difficulties. Despite the formation of creases and badly aligned rolls of cloth, the freedom from watering obtained by this method was encouraging. The smooth, even processing of rolls of fabric which, after saturation with water, are transferred from one machine to another, is often made impossible by the draining of the liquid from the stationary rolls. In view of this inconvenience and the faults mentioned above, other methods of contraction were sought.

The possibility of contracting fabrics on a modified jigger was then considered in order to eliminate the inconvenience of transferring batches of wet fabric from one machine to another. In this series of experiments emphasis was once again placed on ensuring that during wetting the fabric had a long dwell time (ca. 2 min.) before it became part of the roll. In some trials the fabric was wetted-out on an automatic jigger which had been modified to run at a constant linear speed of 1 yd./min.; in other experiments the treatment was carried out on a non-automatic jigger also having a mean linear speed of 1 yd./min.

In all these trials the fabric was wetted-out in a dilute solution of Teepol at 130°F.: preliminary investigations had established that 130°F. was the safe maximum temperature ensuring acceleration of the relaxation of the fabric and avoiding conditions of undue fabric plasticity. Several methods of threading up the two types of machine were tried: the most satisfactory methods are shown in Fig. 5A and 5B.

From a watermarking point of view the results were encouraging. The important deficiencies of the method which emerged from these trials are twofold—

(i) One of the main features of the automatic jigger— constant linear speed— depends on a small braking tension being transmitted from the let-off to the take-up roller via the fabric. When the tension decreases below a certain value, the let-off roller continues to rotate and the take-up roller stops; this causes an "over-run", and the slack fabric collects in the bottom of the bath. On the other hand, when the machine is operating at a very low speed and a safe minimum tension is

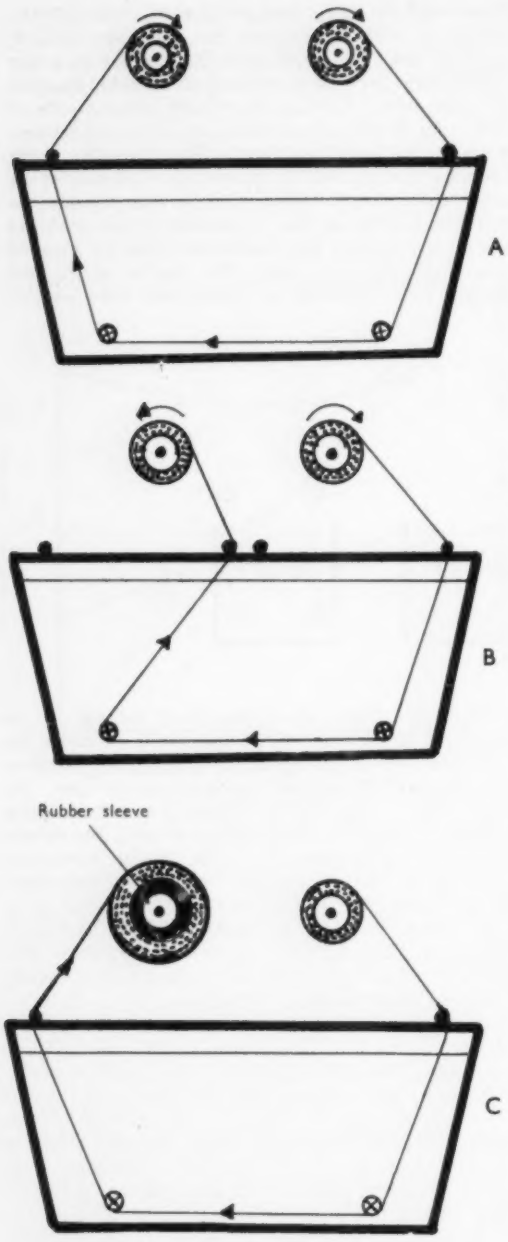

FIG. 5 A–C

applied, snake-shaped contraction creases are formed during the wetting-out run. The fabrics treated on the non-automatic jigger formed satisfactory batches which were soft, pliable, and free from creases. Constant attention and a considerable amount of acquired skill are, however, necessary in using this machine if batches of fabrics free from the danger of telescoping are to be obtained.

(ii) The time of the wetting-out treatment in all these experiments, ca. 6–8 hr. for a 400-yd. batch, is prohibitively long. Nevertheless, the freedom from watering and the pleasant handle of the finished fabrics gave stimulating support for the present hypothesis on the origin and cause of watering.

6.2 In the next series of experiments a remedy was sought to overcome the main objection to methods described above, viz. the long time taken to complete the all-important wetting-out run.

The hypothesis suggests that watering is due to pressures set up by the tendency of the fabric to contract on the roll after wetting-out. The next approach to the problem of amelioration was an attempt to diminish the pressure set up by a given tendency to contract.

In the first method a sleeve of 1-in. thick foam rubber was wrapped round the take-up roller. This sleeve, which is shown in Fig. 5c, was secured by a cotton wrapper and then saturated with water. It was hoped that, as layers of fabric were collected on the take-up roller, increase in pressure beyond a safe limit would be prevented by the cushioning effect of the compressible rubber.

Several 400-yd. batches were processed by the following method: the fabrics were wetted-out at 16 yd./min. in dilute Teepol at 130°F., and then collected on the sleeved roller. On completing the second run, the rubber sleeve was removed, and the fabrics were processed in the normal manner.

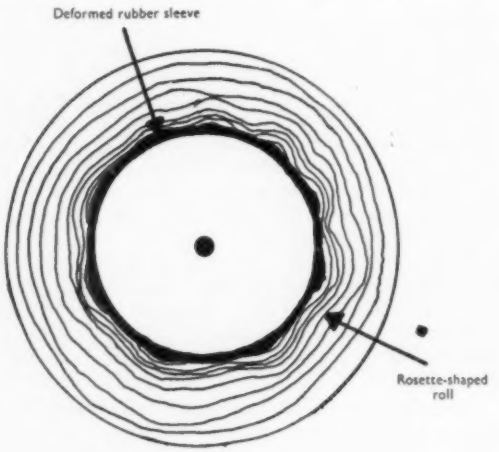

FIG. 6

This method gave fabrics free from watering and creases, and undoubtedly constituted a progressive step in the investigation. Though more practical than those discussed previously, it required constant attention during the wetting-out run to ensure the build-up of a roll of fabric free from the danger of telescoping. The "rubber sleeve" method gave rolls of fabric which were so soft that they almost invariably had a rosette shape, as shown in Fig. 6.

6.3 Next followed the investigation of the possibility of reducing the pressure on the innermost layers of a roll of fabric without discarding the advantage of using a rigid beam. The theory underlying this last approach to the problem of

watering depends on the relationship which exists between the pressure, tension, and radius already given in § 4.1.

We may consider the data of Table II for the replacement of the normal roll of 6 in. diameter ($r = 3$) by a 14-in. diameter ($r = 7$) roll in batching after the first run. At a given tension, due to the inherent tendency of the fabric to contract, pressure on the innermost layers will be reduced approximately to one-third of its original value. A large roller should therefore tend to reduce watering.

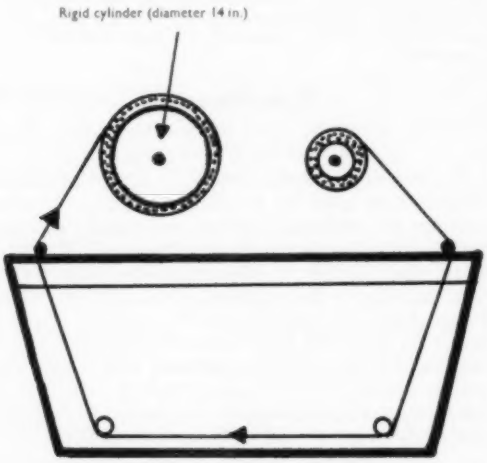

FIG. 7

The series of experiments based on the foregoing considerations provided the most simple and reliable of the methods investigated. The fabric was passed at 27 yd./min. through dilute Teepol at 130°F. and then collected as shown in Fig. 7 on a large cylinder (diameter 13·8 in.). On completing the second run the cylinder was replaced with a 6-in. diameter jigger roller, and the desizing, scouring, and dyeing were continued as usual. The freedom from watering on upwards of 7,000 yd. of fabric which had been treated by this method enhanced considerably the attractiveness of the finished fabrics.

The large-roller method is free from most of the operating difficulties noted for the earlier methods; at worst it involves some inconvenience in inserting and removing the roller. Its reliability has been subsequently confirmed in normal dyehouse use for the large-scale production of acetate poults and taffetas.

7. DISCUSSION AND CONCLUSIONS

The stepwise investigation of the nature and origin of watering of secondary acetate poults and taffetas has shown beyond reasonable doubt that it occurs during the first wetting-out run, and that the moiré pattern is not changed during subsequent scouring and dyeing operations, provided that normal care is taken. Watering is due to the generation of high pressures on the innermost layers by the tension in the fabric due to its tendency to shrink for some minutes (depending on the temperature) after first wetting.

It would therefore appear desirable to relax the fabric completely before batching for the first time. Unfortunately, however, methods based on this approach are impracticable for one reason or another.

Reduction in pressure by increasing roller diameter can decrease the interfabric pressure, but not completely eliminate it. However, in use, a method so based proved to be a practical compromise, giving reasonably smooth operation in the production of fabrics substantially free from watering.

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(*MS. received 2nd July 1959*)

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COMMUNICATIONS

The Separation, Estimation, Orientation, and Ultraviolet Spectra of Isomeric Azo Compounds formed by Diazo Coupling to 1-Naphthylamine and its Derivatives

E. R. WARD, B. D. PEARSON, and P. R. WELLS

Isomeric 2- and 4-azo-1-naphthylamines, formed by diazo coupling to 1-naphthylamine and certain derivatives, are readily separated and estimated by chromatography on alumina columns. Pronounced differences in the ultraviolet spectra of such compounds provide a ready means of orientation. The analytical methods are applicable to very small quantities of material. Besides providing excellent techniques for investigating isomer distributions in diazo coupling to 1-naphthylamine and its derivatives, they may find useful pharmacological applications. Ultraviolet spectra for a number of isomeric pairs are recorded, and the general characteristics of such spectra reported.

Introduction

Diazo coupling to 1-naphthylamine and its derivatives leads to the possibility of reaction occurring at both 2- and 4-positions. Despite its apparent commercial significance in the dye field, very little work indeed has been published on investigating product compositions from such coupling reactions. So little, in fact, when considered in terms of the varying factors that can influence reactions of this type, that it would be unwise to make any detailed interpretation of such a limited body of data.

H. S. Turner [1] made an exploratory investigation of isomer distributions in products arising from reaction between a few diazotised anilines and 1-naphthylamine in aqueous acetic acid, finding that 4-substitution greatly predominated. Prior to this, Gattermann and Liebermann [2] had studied isomer distributions in the coupling of diazotised anilines to 1-naphthylamine-3- and -5-sulphonic acids. It is doubtful whether their analytical methods can be accepted as very reliable, but they claimed, in addition to mixtures of 2- and 4-coupled azo dyes, to have obtained exclusive 2- or 4-coupling in some cases. These latter results are not particularly useful in view of the position of the sulpho substituent in both compounds studied, leading to the possibility of steric influences or neighbouring group participation (cf. Zollinger [3]).

We are now engaged on a systematic investigation in this field, and the purpose of this communication is to record the results of preliminary experiments carried out to devise simple, reliable analytical procedures.

Experimental

DIAZO COUPLING AND CHROMATOGRAPHY OF MIXED AZO COMPOUNDS

For this exploratory work 67% (by vol.) aqueous ethanol was used as coupling medium. In this medium the original amines are readily soluble, and the azo compounds largely insoluble. Furthermore, the change in solvent composition during reaction (due to the addition of the aqueous diazo compound), viz. from 67 to 61% aqueous ethanol, is not so severe as that which would occur if the original solvent were pure ethanol, and in any case avoids the larger differences involved in a change from dry to aqueous organic solvents. In one case the medium used was aqueous hydrochloric acid, and the detailed procedure for this is given below to illustrate the general chromatographic separation technique. Other typical results are summarised in Table I.

COUPLING OF DIAZOTISED 2-NAPHTHYLAMINE TO 1-NAPHTHYLAMINE

2-Naphthylamine (10 g.) was boiled with water (100 c.c.), and hydrochloric acid (sp.gr. 1·18, 10 c.c.) was added at the boil. When all the amine had dissolved, the solution was cooled to 0°c., and sodium nitrite (5·4 g.) in water (20 c.c.) was added in one portion, with vigorous stirring. The filtered diazo solution was added dropwise to a stirred solution of 1-naphthylamine hydrochloride in water at 0°c. (This latter solution was prepared by adding just sufficient hydrochloric acid (sp.gr. 1·18) to a boiling solution of 1-naphthylamine (10 g.) in water (100 c.c.) to dissolve the amine and then adding to water (1·5 litres). The pH was adjusted

TABLE I

Amine	Diazo Compound	Crude Yield* (%)	Pure Yield† (%)	Isomer Distribution‡	Remarks
1-Naphthylamine	2-Naphthylamine	100	98	6·15 ± 0·15	—
5-Nitro-1-naphthylamine	*p*-Nitroaniline	95	97	3·4 ± 0·15	ca. 3% 5-Nitro-1-naphthol also obtained
8-Nitro-1-naphthylamine	*p*-Nitroaniline	90	93	4·75 ± 0·5	1% Bisazo compound also obtained
2-Naphthylamine	*p*-Nitroaniline	—	96	—	—

* The crude yield is calculated assuming the reaction product to be entirely mixed azo compounds.

† The pure yield represents the proportion of this recovered as pure azo compounds by chromatography, except for coupling to 2-naphthylamine where the pure yield is calculated in relation to the starting material.

‡ This is the ratio of the separated 4-azo to the 2-azo compounds. These are extreme values, and the real accuracy may be better than this.

TABLE II

Reaction Products

Compound	M.p. (°C.)	Composition (%) Found C	Found H	Found N	Calculated C	Calculated H	Calculated N	Empirical Formula	λ_{max} (mμ.)	(log ε)	λ_{min} (mμ.)	(log ε)
1-Amino-2,2′-azonaphthalene	—	81·2	5·3	13·6	80·8	5·1	14·1	$C_{20}H_{15}N_3$	236 268 322 476	(4·30) (4·19) (4·41) (4·27)	278 385	(4·10) (3·74)
4-Amino-1,2′-azonaphthalene	—	—	—	—	—	—	—	—	249 267 465	(4·31) (4·24) (4·39)	344	(3·53)
2-*p*-Nitrophenylazo-1-naphthylamine	193	—	—	19·7	—	—	19·2	$C_{16}H_{12}N_4O_2$	229 314 352 521	(4·38) (4·21) (4·14) (4·30)	293 408	(3·93) (3·57)
4-*p*-Nitrophenylazo-1-naphthylamine	250 (cf. 252[6])	—	—	—	—	—	—	—	249 297 528	(4·18) (4·13) (4·46)	232 266 381	(4·08) (4·0) (3·30)
2-*p*-Nitrophenylazo-5-nitro-1-naphthylamine	269	57·2	3·1	20·8	57·0	3·3	20·8	$C_{16}H_{11}O_4N_5$	302 345 507	(4·26) (4·41) (4·38)	276 388	(4·14) (3·81)
4-*p*-Nitrophenylazo-5-nitro-1-naphthylamine	251 (decomp.)	56·9	3·6	—	—	—	—	—	254 280 510	(4·16) (4·11) (4·47)	370	(3·31)
2-*p*-Nitrophenylazo-7-nitro-1-naphthylamine	258	56·9	3·2	—	—	—	—	—	335 513	(4·37) (4·37)	390	(3·64)
4-*p*-Nitrophenylazo-7-nitro-1-naphthylamine	299	—	—	—	—	—	—	—	265 289 496	(4·16) (4·14) (4·35)	352	(3·55)
2-*p*-Nitrophenylazo-8-nitro-1-naphthylamine	216	56·6	3·2	20·6	—	—	—	—	219 315 347 505	(4·49) (4·32) (4·27) (4·23)	269 297	(4·05) (3·75)
4-*p*-Nitrophenylazo-8-nitro-1-naphthylamine	219 (decomp.)	57·2	3·2	20·4	—	—	—	—	282 478	(4·18) (4·37)	355	(3·55)
2-*p*-Nitrophenyl-1,3-(5-nitro-1,2-naphtho)-1,2,3-triazole*	244 (decomp.)	55·8	2·5	—	57·0	2·7	—	$C_{16}H_9O_4N_5$	—		—	
2,4-Bis-*p*-nitrophenylazo-8-nitro-1-naphthylamine	204 (decomp.)	54·2	2·9	—	54·3	2·9	—	$C_{22}H_{14}O_8N_8$	—		—	

* Formed by oxidation of 2-*p*-nitrophenylazo-5-nitro-1-naphthylamine with chromium trioxide in hot acetic acid.

to ca. 3·5 by the addition of sodium carbonate solution.) After stirring for 2 hr. the aminoazo compounds were precipitated by making the solution alkaline with ammonia. The red solids (20·8 g.) were collected, washed with water, and air-dried.

Chromatography of a portion (1·826 g.) in benzene on an alumina column (3·5 cm. × 25 cm.) gave two bands. The lower band was eluted with benzene–ethyl acetate (20:1 by vol.), yielding 1-amino-2,2′-azonaphthalene (0·250 g., m.p. 189–190°); from benzene–light petroleum (b.p. 60–80°) (1:1 by vol.) this was obtained as lustrous red plates, m.p. 193–194°. The upper band was eluted with ethyl acetate, giving 4-amino-1,2′-azonaphthalene (1·540 g., m.p. 135–136°); from the benzene–light petroleum feathery orange needles, m.p. 144–145° (cf. 152°, Nietzki and Göttig[4]; 136°, Cook, Hewett, and Kennaway[5]).

Reaction Products

The ultraviolet spectra of solutions of the reaction products in absolute ethanol were recorded by means of a Unicam SP 500 photoelectric spectrophotometer. Details concerning the products are listed in Table II.

Discussion

Following Turner[1], we have used chromatography on alumina columns to analyse reaction products, but whereas he extruded the column after development, with subsequent extraction of the mechanically separated bands, our simpler procedure employs direct elution with mixtures of benzene and ethyl acetate or with ethyl acetate alone (following development of the column with benzene or benzene–ethyl acetate, cf. Ward and Wells[7, 8]). It appears that our method could detect isomers present in as low a concentration as 0·5% and, depending on the product composition, individual isomers might be estimated to ± 1%. Furthermore, only very small quantities (50–100 mg.) need be used in these separations, since we have found also that the reaction products can most conveniently be orientated by means of pronounced differences in their ultraviolet spectra. The 2-azo-1-naphthylamines show a double maximum in the region 300–350 mμ., whereas the 4-azo-1-naphthylamines all show a deep trough in this region. This is illustrated in Fig. 1.

In each case the 2-azo-1-naphthylamine is eluted first, followed by the 4-azo-1-naphthylamine. By-products were also conveniently separated out in this manner (cf. Wells[8]).

These pronounced spectral differences suggested that the composition of the crude reaction product could be obtained directly from its ultraviolet spectrum (cf. Dewar and Urch[9]), but unfortunately

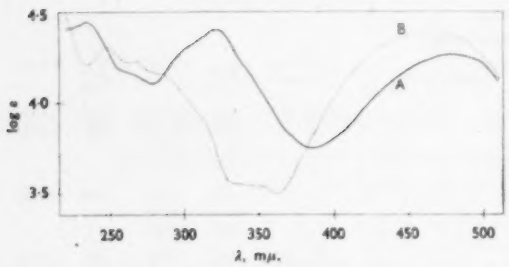

FIG. 1—The Ultraviolet Spectra of 1-Amino-2,2′-azonaphthalene (A) and 4-Amino-1,2′-azonaphthalene (B)

there are usually present small amounts of strongly absorbing materials which prevent accurate estimations being made.

The general characteristics of the ultraviolet spectra of the isomeric 2- and 4-azo-1-naphthylamines are illustrated in Fig. 2. We propose to make a detailed analysis of our spectra and those recorded by Turner in a subsequent communication.

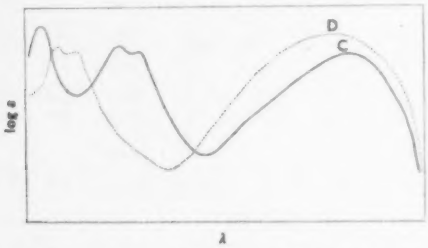

FIG. 2—The General Characteristics of the Ultraviolet Spectra of the Isomeric 2- and 4-Azo-1-naphthylamines (C and D respectively) in the region 220–550 mμ.

As recorded in Table I, coupling of diazotised *p*-nitroaniline to 2-naphthylamine gave exclusive coupling at the 1-position. We thought it just possible that even with this relatively weak electrophilic reagent some coupling might occur at the 6-position, but our chromatographic separation now excludes this.

Finally we would like to point out that, since azo dyes derived from 1-naphthylamine, especially 2-azo-1-naphthylamines, are potentially carcinogenic, and may find some application in the foodstuffs industry, our new analytical methods might find useful application in pharmacological studies in this field (cf. Williams [10]).

* * *

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Chemical Modification of Flax Cellulose
I—Action of Acrylonitrile, Chloroacetic Acid, and β-Propiolactone

N. GOKAL and J. K. SKELLY

The reaction of flax yarn with acrylonitrile, chloroacetic acid, and β-propiolactone in presence of sodium hydroxide as catalyst has been studied. The results are compared with those obtained with cotton in earlier work. Under the experimental conditions used, measurable differences in reactivity between the two fibres are apparent. The cause of this difference in reactivity has been investigated and is explained by consideration of the effect of different concentrations of sodium hydroxide solutions on the two fibres. In general, for a given alkali concentration flax absorbs more sodium hydroxide and water than does cotton. This gives a greater change in the fine structure of the flax fibre produced by mercerising strengths of alkali. The effect of mercerising-strength sodium hydroxide on the nodes present in flax fibre, which act as major points of entry to the fibre, is also pointed out.

Introduction

Hydroxyl groups in cellulose fibres can react with suitable reagents by substitution or addition reactions. This type of chemical modification causes permanent changes in fibre properties. In this work the first object was to establish optimum conditions for partial chemical modification of flax cellulose with acrylonitrile, chloroacetic acid, and β-propiolactone. The optimum conditions are taken as those which promote maximum reaction with hydroxyl groups in cellulose while retaining the fibrous form and the tensile strength to the greatest degree possible.

The reaction conditions for partial modification of cotton with these reagents have been investigated by several workers and recently reviewed by Buras [1] and Fisher and Perkerson [2]. It would be expected that optimum conditions for flax would be similar, *per se*, to those which have been established for cotton. The work published by Daul, Reinhardt, and Reid on chemical modification of cotton has been used as a basis for the present study of the reaction of flax with acrylonitrile [3], chloroacetic acid [4], and β-propiolactone [5].

Addition of the olefinic monomer, acrylonitrile, to hydroxyl groups in cellulose (R·OH) in presence

of sodium hydroxide gives β-cyanoethyl derivatives —

$$R{\cdot}OH + CH_2{:}CH{\cdot}CN \xrightarrow{NaOH} R{\cdot}O{\cdot}CH_2{\cdot}CH_2{\cdot}CN$$

The normal cyanoethylation process for cotton consists in first impregnating the fibre with caustic soda and then treating it with acrylonitrile [6, 7]. However, the reaction conditions must be chosen to minimise side-reactions [8].

Chloroacetic acid reacts with hydroxyl groups in cellulose in presence of caustic soda to yield carboxymethylcellulose —

$$R{\cdot}OH + Cl{\cdot}CH_2{\cdot}COOH + NaOH \rightarrow R{\cdot}O{\cdot}CH_2{\cdot}COONa + Cl{\cdot}CH_2{\cdot}COONa$$

In partial carboxymethylation of cotton it is necessary to impregnate with chloroacetic acid solution first and then treat with sodium hydroxide solution [9]. When the process is carried out in the reverse order, excess sodium hydroxide on the fibre forms sodium chloroacetate on treatment with chloroacetic acid. This salt is only slightly soluble in the concentrated alkaline solution used, and does not penetrate sufficiently into the fibre to give a uniform treatment.

β-Propiolactone may react with hydroxyl groups in cellulose by either etherification (i) or esterification (ii) reactions, depending upon the conditions used [10]—

$$R{\cdot}OH + \overbrace{O{\cdot}CH_2{\cdot}CH_2{\cdot}CO} \begin{cases} \nearrow R{\cdot}O{\cdot}CH_2{\cdot}CH_2{\cdot}COOH & \text{(i)} \\ \searrow R{\cdot}O{\cdot}CO{\cdot}CH_2{\cdot}CH_2OH & \text{(ii)} \end{cases}$$

In either case further reaction with β-propiolactone can lead to formation of graft polymers shown in (iii) and (iv) respectively.

$$R{\cdot}O{\cdot}CH_2{\cdot}CH_2{\cdot}COOH + \overbrace{O{\cdot}CH_2{\cdot}CH_2{\cdot}CO} \rightarrow R{\cdot}O{\cdot}CH_2{\cdot}CH_2{\cdot}CO{\cdot}[O{\cdot}CH_2{\cdot}CH_2{\cdot}CO]_n{\cdot}OH \quad \text{(iii)}$$

$$R{\cdot}O{\cdot}CO{\cdot}CH_2{\cdot}CH_2OH + \overbrace{O{\cdot}CH_2{\cdot}CH_2{\cdot}CO} \rightarrow R{\cdot}O{\cdot}CO{\cdot}CH_2{\cdot}CH_2{\cdot}[O{\cdot}CH_2{\cdot}CH_2{\cdot}CO]_n{\cdot}OH + R{\cdot}O{\cdot}CO{\cdot}CH_2{\cdot}CH_2{\cdot}O{\cdot}[CO{\cdot}CH_2{\cdot}CH_2{\cdot}O]_n{\cdot}H \quad \text{(iv)}$$

Gresham *et al.*[11] investigated this reaction with alcohols and found that, either in presence of acid catalysts or without catalysts, reaction (i) occurred, while (ii) required basic catalysts. In practice sodium hydroxide solution has been used as basic catalyst in the reaction with cotton, and pretreatment with alkali was the preferred method [5]. In this process the alkali can cause loss of reagent through formation of sodium β-hydroxypropionate and polymerisation with production of water-soluble sodium salts of polyesters—

$$\overbrace{O{\cdot}CH_2{\cdot}CH_2{\cdot}CO} \xrightarrow{NaOH} HO{\cdot}CH_2{\cdot}CH_2{\cdot}COONa + HO{\cdot}CH_2{\cdot}CH_2{\cdot}CO{\cdot}[O{\cdot}CH_2{\cdot}CH_2{\cdot}CO]_n{\cdot}ONa$$

Polymerisation was minimised by carrying out the reaction at a low temperature (5°C.).

Experimental

MATERIALS

FLAX— A bundle (16⅔ hanks) of grey flax yarn (25s lea, line yarn) was bleached in the laboratory by sequence lye boil, acid chemic, hydrogen peroxide, and final alkaline chemic [12]. The yarn was air-dried and was a ¾ white with fluidity 5·3.

COTTON— Commercially bleached 8s-count cotton yarn (equivalent to 22·4s linen lea) with fluidity 6·1 was used. Wax was removed from this yarn by giving a 2-hr. boil in ethanolamine (Hopkin & Williams, reagent grade) with liquor ratio 37:1, and then washing and air-drying [3].

ACRYLONITRILE— Reagent grade (Eastman Kodak Co.) with 0·7% (wt./vol.) water content, used without further purification.

CHLOROACETIC ACID— Reagent grade (Mersey Chemicals Ltd.), purity 99·7%.

β-PROPIOLACTONE— Reagent grade (Eastman Kodak Co.), n_D^{20} 1·4119, used without redistillation.

ANALYSIS

NITROGEN CONTENT— A modified Kjeldahl method [3] was found satisfactory. The preliminary acid digestion step was omitted for cyanoethylated samples. The experimental conditions for distillation from sodium hydroxide solution were those described by Strouts *et al.*[13] using the semi-micro apparatus made by Quickfit & Quartz Ltd. The results obtained by this modified method could be repeated within ± 1%, and were 2% in error compared with those obtained by a normal Kjeldahl procedure with selected samples [14]. The results are given as percentages of nitrogen in oven-dry samples.

CARBOXYL CONTENT— The general procedure described by Daul *et al.*[15] based on back-titration of free carboxyl groups was adopted. The results are calculated as percentage carboxyl contents in oven-dry samples.

BREAKING STRENGTH— A Mulholland standard yarn tester (5-lb. machine) was used, the figures reported being the average of twenty breaks.

BARIUM ACTIVITY NUMBER— The method described by Edelstein [16] was employed.

IMBIBITION VALUE— The method given by Dorkin and Chamberlain [17] was used. The imbibition value has been defined by Cameron and Morton [18] as the quantity of water, in parts per 100 parts of dry fibre, retained by the wet fibre after centrifuging a 0·5-g. sample at 1000 ***g*** for 5 min.

PROCEDURE

All sodium hydroxide and chloroacetic acid concentrations are given on a weight/volume basis accurate to ± 0·1% and checked by titration. The β-propiolactone concentrations are on a volume/volume basis.

PARTIAL CYANOETHYLATION— The following conditions were standardised [3]. Skeins of bleached flax yarn (4 g.) were steeped in 100 ml. sodium hydroxide solution of specified concentration at 18–20°C. for 15 min. The skeins were transferred without squeezing to a centrifuge tube containing a perforated steel diaphragm 4·0 cm. from the base of the tube. Centrifuging was carried out at 350 ***g*** for 3 min. The skeins were weighed and placed in a flask, fitted with a condenser, containing 100 ml. acrylonitrile at the temperature and for the time specified. Immediately at the end of the reaction time the skein was plunged into 5% acetic acid solution, washed for 10 min.; and dried at 90–100°C.

PARTIAL CARBOXYMETHYLATION—Skeins of bleached flax yarn (4 g.) were impregnated with 100 ml. aqueous chloroacetic acid of specified concentration at 26–27°c. for 3 min. and centrifuged to obtain $60 \pm 1\%$ pick-up[4]. It was necessary to use a polyethylene diaphragm and base in the centrifuge tube to avoid corrosion. The centrifuged skeins were placed in 100 ml. sodium hydroxide solution of specified concentration at 26–27°c. for 30 min. Although it has been reported that the temperature rises to 40–50°c. at this stage in the reaction with cotton[4], no temperature rise was observed in the present work. After the alkali treatment the yarn was washed, neutralised with 4% hydrochloric acid for 5 min., washed, treated with 2% sodium bicarbonate for 5 min., washed until yarn gave pH > 6·8 with bromocresol purple indicator, and dried at 50–60°c. Washing was carried out with distilled water in every case.

REACTION WITH β-PROPIOLACTONE—The following conditions were standardised[5]. Skeins of bleached flax yarn (4 g.) were impregnated with 100 ml. of 15% sodium hydroxide solution at 5°c. for 15 min. and centrifuged at 850 ***g*** for 3 min., giving $320 \pm 5\%$ pick-up. The skeins were weighed and placed in 50 ml. β-propiolactone solution of specified concentration in distilled water at 5°c. for 60 min. The temperature of the solution rose to 15–20°c. immediately the yarn was placed in it, but fell to 5°c. again within 3 min. The yarn was aftertreated as described for the carboxymethylation procedure. However, before drying an additional 30-min. extraction with boiling water was given to remove soluble by-products. The yarn was dried at 40–50°c. and left in an oven overnight at 90–100°c. prior to weighing. The treated samples were hydrolysed to remove ester groups by treating 0·5 g. with 30 ml. of 2% sodium hydroxide solution on a steam bath for 3 hr., and aftertreating as before.

TREATMENT WITH SODIUM HYDROXIDE SOLUTIONS—Skeins of flax and cotton yarn (4 g.) were steeped in sodium hydroxide solution of specified concentration without tension at 20°c. for 15 min., centrifuged at 1000 ***g*** for 3 min., and weighed. The yarn was placed in a beaker containing 50 ml. distilled water, and allowed to stand for 5 min.; without removing the yarn, the solution was titrated against standard hydrochloric acid to estimate the alkali absorbed[6]. The skein was washed, neutralised in 2% sodium bicarbonate solution, washed, and air-dried. The amount of alkali absorbed was expressed as grams of sodium hydroxide absorbed per gram of air-dry cellulose (6–7% moisture content). The amount of water absorbed was calculated from wet pick-up by correcting for weight of caustic soda absorbed.

Results and Discussion

PARTIAL CYANOETHYLATION OF FLAX CELLULOSE

The following variables in the reaction conditions were studied.

Sodium Hydroxide Concentration

The alkali concentration was varied from 2 to 30%, and treatment in acrylonitrile standardised at 20°c. for 30 min. Nitrogen content and breaking strength are plotted against sodium hydroxide concentration in Fig. 1. Gelatinised samples were obtained for alkali concentrations > 8%, and maximum reaction with flax was observed with 10–15% caustic soda solutions, as has been found with cotton[3]. However, a much greater loss in breaking strength was observed with flax in this concentration range, corresponding to 70% compared with 20% for cotton[3]. It was demonstrated that no significant degree of hydrolysis of cyanoethyl to carboxyethyl groups occurred with

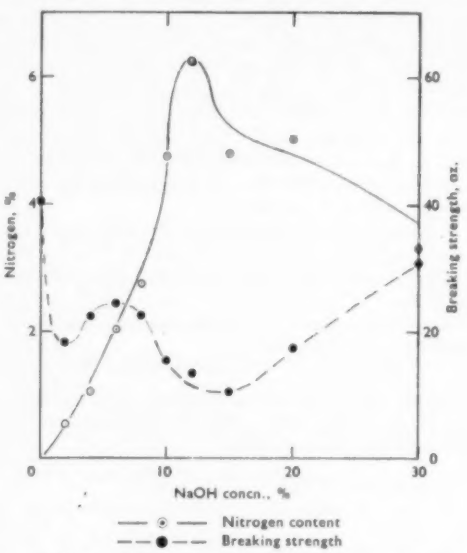

FIG. 1—Relation between Sodium Hydroxide Concentration and Nitrogen Content and Breaking Strength of Cyanoethylated Flax Yarn

sodium hydroxide concentrations >12% (Table I). Thus the reduced nitrogen contents observed with caustic soda concentrations >12% could be due to the physical effect on flax of the preferential absorption of water, which has been shown to occur above this critical concentration (Fig. 7), or alternatively through loss of acrylonitrile by polymerisation reactions *in situ* due to high alkali concentration.

Temperature of Acrylonitrile

Sodium hydroxide concentrations of 6% gave the greatest degree of reaction with acrylonitrile at 20°c. for a given strength loss (Fig. 1). However, high caustic soda concentrations, combined with elevated reaction temperatures, promote loss of acrylonitrile through side-reactions and hydrolysis of cyanoethyl groups. The alkali concentration was therefore kept as low as possible in these experiments, and the results were also directly comparable with those obtained on cotton[3].

TABLE I

NaOH, % wt./vol.	2	4	6	8	10	12	15	20	30
Carboxyethyl content, % wt./wt. ...	0·073	0·146	0·146	0·109	0·037	0·000	0·037	0·038	0·146

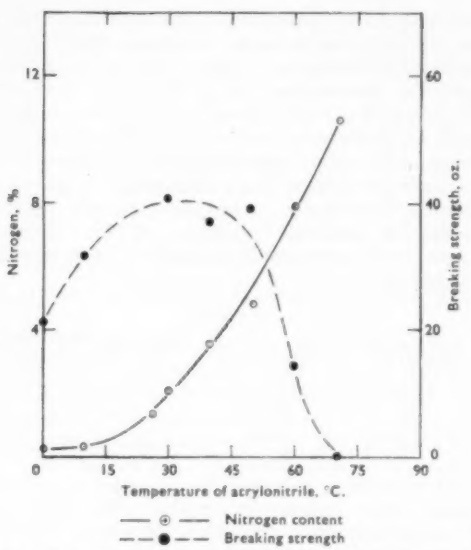

FIG. 2—Relation between Temperature of Acrylonitrile and Nitrogen Content and Breaking Strength of Cyanoethylated Flax Yarn

The sodium hydroxide concentration was standardised at 2%, and the temperature of the acrylonitrile varied from 0° to 70·4°C. for reaction times of 30 min. The latter temperature is the boiling point of the acrylonitrile–water azeotrope formed in the reaction. Nitrogen content and breaking strength results are given in Fig. 2. A reaction temperature of 50°C. appears to be the optimum for cyanoethylated flax with 4·8% nitrogen content and no loss in breaking strength.

Time of Acrylonitrile Treatment

The sodium hydroxide concentration was standardised at 2%, and the time of reaction in acrylonitrile at 50°C. varied from 10 to 208 min.

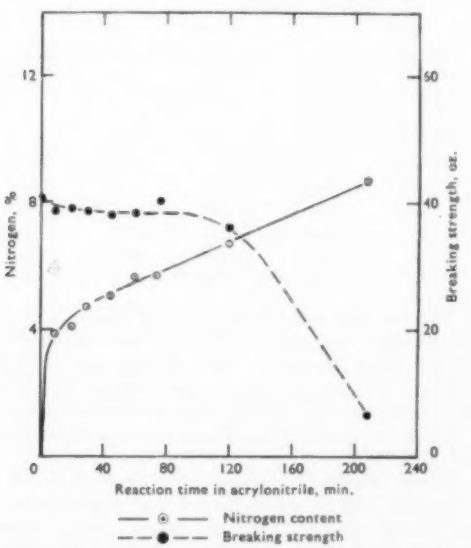

FIG. 3—Relation between Time of Reaction in Acrylonitrile and Nitrogen Content and Breaking Strength of Cyanoethylated Flax Yarn

Results are shown in Fig. 3. It is apparent that up to 6% nitrogen can be introduced with reaction times of 80 min. before a significant drop in breaking strength is observed with flax. This long reaction time is not desirable, as it will increase by-product formation. However, on cotton it was reported that times of reaction at 50°C. > 30 min. resulted in loss of breaking strength [3].

Water Content of Acrylonitrile

The above experiments were carried out using stock acrylonitrile containing 0·7% water. Almost anhydrous reagent was prepared by standing over calcium chloride overnight and filtering. The water content was estimated using Karl Fischer's reagent No. 1 [19] and was found to be 0·09% (wt./vol.). A series of solutions of different water contents was prepared from this almost anhydrous sample with water contents up to 3%.

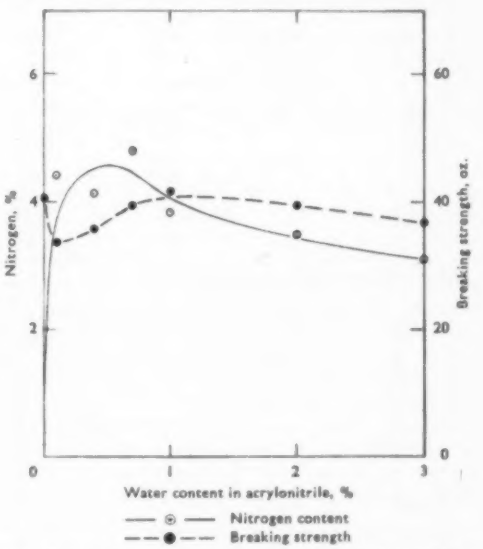

FIG. 4—Relation between Water Content of Acrylonitrile and Nitrogen Content and Breaking Strength of Cyanoethylated Flax Yarn

In the cyanoethylation treatments optimum conditions determined from the previous experiments were used: impregnate in 2% sodium hydroxide solution at 20°C. for 15 min., centrifuge to 75% pick-up, and treat in acrylonitrile at 50°C. for 30 min. Reaction with the minimum amount of water (0·09%) in acrylonitrile was preceded by treatment of a previously oven-dried skein of yarn in 2% sodium hydroxide in absolute alcohol. In all the other reactions air-dry skeins containing 6–7% moisture content were treated with aqueous 2% caustic soda solutions. Results are plotted in Fig. 4. It has been confirmed that water is essential for the reaction to occur [7], and 0·7% water content in acrylonitrile gives maximum reaction with flax for the specified reaction conditions.

Optimum conditions for cyanoethylation of flax yarn by the two-stage process are similar to those established for cotton [3]: they give 4·5–4·7% combined nitrogen (degree of substitution D.S. 0·65) with no loss in breaking strength compared

with untreated flax yarn. Similar conditions on cotton yarn have been shown to give 3·6% nitrogen content (D.S. 0·50) with 16% loss in breaking strength [3].

PARTIAL CARBOXYMETHYLATION OF FLAX CELLULOSE

The effect of impregnation in 5–50% chloroacetic acid solutions followed by aftertreatment in 30%, 40%, and 50% sodium hydroxide solutions was studied. Results of carboxyl estimations were expressed as D.S. of carboxymethyl groups per anhydroglucose unit and are plotted against chloroacetic acid concentration (Fig. 5). Breaking strengths are given in Table II.

TABLE II

Breaking Strength (oz.)

Chloroacetic Acid Concn. (%)	Aftertreatment in NaOH soln. 30%	40%	50%
Untreated	40·2	40·2	40·2
Control	24·2	26·2	22·3
5	—	21·7	17·2
10	25·5	24·4	21·2
15	—	27·4	25·0
20	20·7	28·2	19·7*
25	—	30·0	11·8*
30	20·4	26·3	8·4*
40	—	33·1	8·3*
50	31·9	30·1	5·9*

* Highly swollen and partly gelatinised sample.

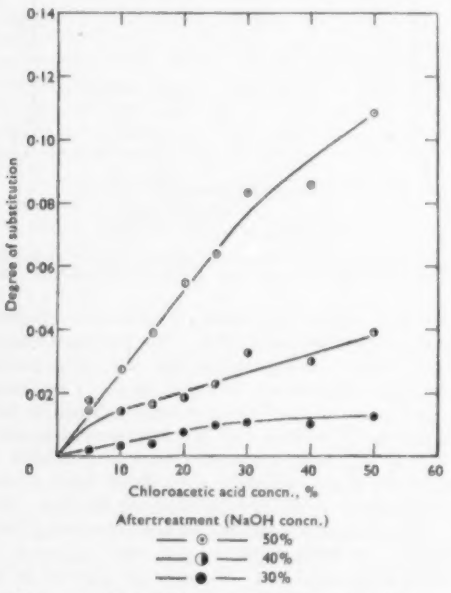

FIG. 5—Carboxymethylation of Flax Yarn at 26–27°C.

It is clear from Fig. 5 that the highest D.S. values were given by 50% sodium hydroxide solutions, but were accompanied by gelatinisation and excessive loss in strength. In contrast, 30% caustic soda solutions gave extremely low D.S. values, and when 40% alkali was used a balance was obtained between D.S. and loss in breaking strength. The optimum results were obtained by use of 40% chloroacetic acid and 40% sodium hydroxide solutions. This treatment gave a partially carboxymethylated flax yarn with D.S. 0·03 and 17% loss in breaking strength compared with untreated yarn. It has been shown that much higher D.S. values (up to 0·14) can be obtained on cotton yarn without loss in breaking strength using 5–25% chloroacetic acid and 30–50% sodium hydroxide solutions [4]. In general, flax shows a much lower reactivity than cotton in this reaction (Table III).

TABLE III

Treatment NaOH (%)	Treatment $Cl\text{-}CH_2\text{-}COOH$ (%)	Degree of Substitution Flax	Degree of Substitution Cotton [4]
30	25	0·010	0·067
40	25	0·023	0·125
50	25	0·064	0·143

It has been recorded that partially carboxymethylated cotton yarn (D.S. 0·01–0·15) has increased breaking strength [4]. However, Table II shows that a range of partially carboxymethylated flax yarns (D.S. $< 0·10$) had a 17–70% strength loss, while alkali-treated controls had ca. 40% loss compared with the untreated yarn in each case.

REACTION OF FLAX CELLULOSE WITH β-PROPIOLACTONE

Flax yarn was pretreated with the optimum alkali concentration (15%) determined for this reaction on cotton and then treated with 5–25% β-propiolactone solutions at 5°C. Carboxyl content, breaking strength, and gain in weight were estimated for each sample. Carboxyl content after hydrolysis in 2% sodium hydroxide solution was determined to indicate extent of formation of esterified products. Results are shown in Table IV. The carboxyl contents of the treated samples were calculated after allowing for the carboxyl content of the control.

TABLE IV

β-Propiolactone (% vol./vol.)	Weight Gain (% on dry wt.)	Carboxyl Content (%) Before Hydrolysis	Carboxyl Content (%) After Hydrolysis	Breaking Strength (oz.)
Untreated	—	—	—	40·2
Control	0·00	0·39	0·39	22·2
5	0·00	0·05	0·00	16·2
10	4·71	6·87	0·00	18·8
15	15·12	13·10	0·00	24·3
20	24·20	14·60	0·06	23·3
25	29·60	16·55	0·08	18·9

The almost complete removal of carboxyl groups by alkaline hydrolysis indicates that esterification is the main reaction. The appreciable carboxyl content of the treated samples before hydrolysis is explained by graft polymerisation due to etherification on the initially formed ester (reactions (ii) and (iv)).

These results obtained with flax are not in complete conformity with those reported for cotton, in which 10–20% of the carboxyethyl groups present were found to remain after hydrolysis owing to direct etherification (i) of some hydroxyl

groups in cotton[5]. The primary reaction of β-propiolactone with flax is thus esterification, as has been shown to occur with alcohols in the presence of basic catalysts[11]. Maximum reaction is obtained by using the most concentrated possible β-propiolactone solution (25%) at 5°c. and giving a pretreatment in 15% sodium hydroxide solution. The temperature of the reagent and the alkali concentration were the optimum found for cotton[5], and prevent loss of reagent through polymerisation side-reactions.

TREATMENT OF FLAX AND COTTON CELLULOSE WITH ALKALI

The observed differences in chemical reactivity between flax and cotton could be caused by differences in the effect of caustic soda solutions on the fine structure of the two fibres. When non-mercerising alkali concentrations, viz. those which cause inter- but not intra-crystalline penetration, were used in cyanoethylation experiments, the reactivity of flax to acrylonitrile was only slightly different from that of cotton. By comparison, mercerising concentrations, viz. those which promote both inter- and intra-crystalline penetration, were used in carboxymethylation treatments, and flax gave much lower degrees of substitution than cotton. Similarly, in β-propiolactone reactions mercerising concentrations were adopted, and significant differences in reactivity were observed between the two fibres. As a result, it appeared to be of interest to investigate the effect of solutions of different alkali concentration upon flax and cotton.

Flax and cotton yarns were steeped in 2–50% sodium hydroxide solutions, centrifuged, and aftertreated as described in the Experimental Section. The amounts of sodium hydroxide and water absorbed were determined (Fig. 6 and 7). A smooth absorption curve for sodium hydroxide is given for both fibres, and flax absorbs consistently a greater amount than cotton for all concentrations >5%. Compton[6] found an absorption curve for cotton similar to that given in Fig. 6. The water-absorption curves similarly demonstrate a greater take-up of water by flax for all sodium hydroxide concentrations >5% with a peak at 15% for both fibres. It is of interest that these curves closely resemble the shape of those quoted by Marsh[20] for free shrinkage of flax, ramie, and cotton yarns in sodium hydroxide solutions. The greater absorption of sodium hydroxide and water by flax yarn is accompanied by 25–35% loss in breaking strength for all treatments in >12% caustic soda solutions with free shrinkage, while

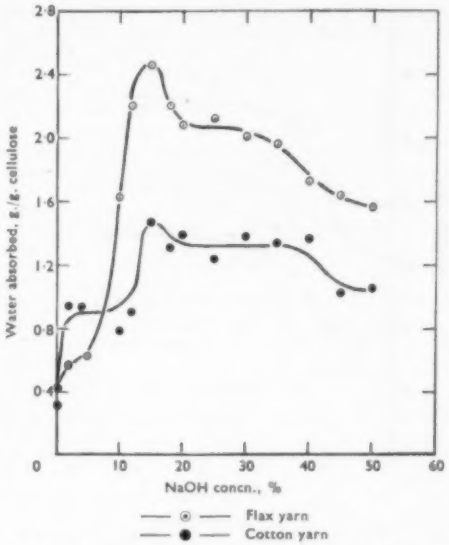

FIG. 7—Relation between Weight of Water absorbed by Flax and by Cotton and Concentration of Sodium Hydroxide Solution

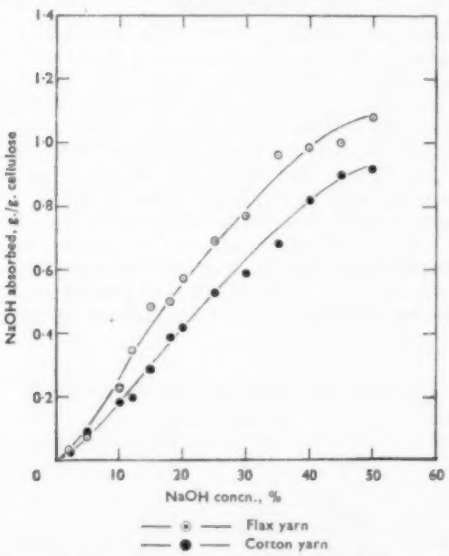

FIG. 6—Relation between Weight of Sodium Hydroxide absorbed by Flax and by Cotton and Concentration of Alkali

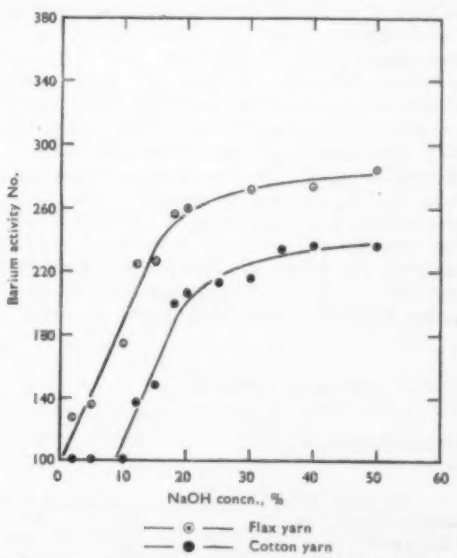

FIG. 8—Relation between Barium Activity Number of Treated Yarn and Concentration of Sodium Hydroxide Solution

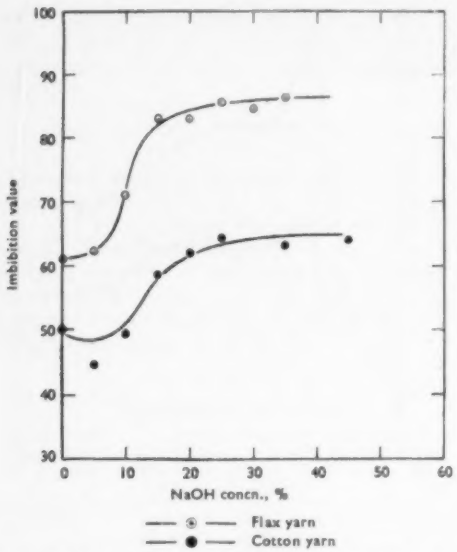

FIG. 9—Relation between Imbibition Value of Treated Yarn and Concentration of Sodium Hydroxide Solution

cotton under the same conditions maintained its strength (Table V).

The general shape of the sodium hydroxide and water absorption curves for cotton and flax broadly confirms the stages of alkali absorption for native cellulose fibres put forward by G. and T. Petitpas [21].

The measured differences between flax and cotton must be due to physical differences in the morphological and fine structure of the two fibres. The physical effect of alkali treatment on flax and cotton yarns was followed by determining the change in absorptive capacity as measured by the barium activity number [22] (Fig. 8). Further confirmation of this effect was obtained by determination of water-imbibition values for the alkali-treated samples (Fig. 9). Once again the two fibres show similar behaviour, and the higher absorptive capacity of flax at each sodium hydroxide concentration confirms that flax has been swollen to a greater extent by the imbibed water accompanying the absorbed alkali, as indicated in Fig. 7. The general shape of the curves shown in Fig. 8 and 9 resembles the general mercerisation curve described by Marsh [23], in which other established methods have been used for measuring the effect of alkali on cellulose fibres. From Fig. 8 and 9 it is apparent that there is a definite tendency with both fibres to reach an equilibrium absorptive capacity at sodium hydroxide concentrations >15%, and maximum water absorption was indicated at 15% alkali concentration (Fig. 7).

The morphological structure of flax fibre may also contribute to the observed effects, especially the transverse dislocation marks or nodes, which are typical of all bast fibres. Derrett-Smith [24] has pointed out that water is initially absorbed rapidly into flax fibre via the nodes, giving flax a more rapid initial absorption of water than cotton. The effect of alkali treatments on the nodes is of interest because of their importance as points of entry to the fibre. Microscopical examination of the alkali-treated flax fibres mounted in liquid paraffin showed that nodes became less obvious for sodium hydroxide concentrations at and above 12%. Similarly, deconvolution of cotton fibres commenced at about this concentration. However, careful examination of the flax fibres treated with 45% sodium hydroxide solution, without tension, still revealed nodes on most fibres, and their presence was readily confirmed by observation under polarised light.

The greater absorption of sodium hydroxide by flax compared with cotton may also promote side-reactions with entering reagents to a greater extent. This would explain the decreased reactivity of flax with chloroacetic acid. The interaction product sodium chloroacetate has low solubility in concentrated alkali and is less effective as a reagent. Reaction of flax with β-propiolactone was almost entirely esterification, as occurs with alcohols in presence of sodium hydroxide. In the case of cotton a proportion of ether formation has been recorded, and etherification is known to occur in presence of acid catalysts, or without catalysts. It would appear reasonable to attribute the formation of ethers with cotton but not with flax to the lower total alkali absorption of cotton.

Conclusion

Reaction conditions have been established for maximum chemical modification of flax yarn with acrylonitrile, chloroacetic acid, and β-propiolactone with minimum loss in tensile strength. Sodium hydroxide solutions were used as basic catalyst in each of these reactions, and small, but significant, differences in reactivity of flax compared with cotton yarns were recorded. The observed differences can be explained by consideration of the following factors—(*a*) greater alkali absorption by flax for a given concentration of caustic soda; (*b*) physical effect of greater amount of water absorbed by flax for sodium hydroxide

TABLE V

Sodium hydroxide concn., %...	0	2	15	20	30	40	50
			FLAX YARN				
Breaking strength, oz.	40·2	38·1	26·5	29·7	29·3	25·9	30·3
Flax lea	26·4	27·5	20·6	20·2	18·8	18·0	18·0
			COTTON YARN				
Breaking strength, oz.	23·4	23·3	23·2	24·6	23·4	24·8	25·2
Cotton count*	8·1 (22·7)	8·1 (22·7)	7·5 (21·0)	6·4 (17·9)	5·9 (16·5)	6·8 (19·0)	6·5 (18·2)

* Equivalent linen lea in brackets.

concentrations >5%, which causes a larger change in the pore size and less strongly hydrogen-bonded regions of the fibre (this factor would account for the more pronounced differences in reactivity observed between the two fibres when concentrations of alkali >12%, which cause intracrystalline penetration, were used); and (*c*) physical effect on the nodes in flax fibre of sodium hydroxide concentrations >12%.

* * *

The authors wish to express their thanks to Mr. R. E. Perioli, officer-in-charge, Belfast Public Textile Testing House, for permission to use physical testing apparatus.

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CORRESPONDENCE

The Editor does not hold himself responsible for opinions expressed by correspondents

Changes of Colour caused by Fluorescent Brightening Agents

The incorporation of fluorescent brightening agents in domestic washing powders is now widespread, and it has been observed [1] that they can give rise to changes of colour when fabrics dyed to pastel colours with fast (e.g. vat) dyes are washed. As these changes of colour are visible only in light containing ultraviolet radiation (e.g. daylight), it is clear that they are caused by the added colour of the fluorescent brightening agent and not by any intrinsic lack of fastness of the dyeing.

We have found that Fibrofix, a cyanamide–formaldehyde compound made by Courtaulds Ltd. (selling agents Hexoran Co. Ltd.) has a very efficient quenching effect on these fluorescent brightening agents, and treatment of dyed material in 1% (on weight of fibre) Fibrofix at 70°C. for 20 min. protects it against changes of colour on subsequent washing in the presence of brightening agents. Further, if a fabric which has already been washed in a solution containing brightening agents with consequent colour change is similarly treated with Fibrofix, it is returned to its original colour.

Fibrofix solutions transmit wavelengths down to 330 mμ., and the quenching action is therefore not due to absorption of ultraviolet radiation. The fact that it is effective only with anionic fluorescent brightening agents, and not with non-ionic (disperse) and cationic types, suggests that an ionic interaction is occurring.

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[1] Ward, C. F., *J. Textile Inst.*, **50**, P 161 (March 1959).

Notes

Meetings of Council and Committees
September

Council— No meeting
Publications— 14th
Fastness Tests Coordinating— 10th
Colour Index Editorial Board— 23rd
I.F.A.T.C.C. Council of Delegates— 15th
Review of Textile Progress— 3rd.

Death

We regret to report the death of Mr. Fred Smith (a Past President of the Society).

Resignation of Dr. C. J. W. Hooper

Our members will learn with regret of the resignation, effective from October 31st, of Dr. Hooper, Editor of the *Journal* since January

1948, so that he can devote his time to the translation of foreign, and in particular Russian, articles.

Dr. Hooper has ably maintained the high standard of the *Journal* and we wish him well in his new venture. The members of the Publications Committee, who have been intimately concerned in the work of publishing the *Journal*, wish to place on record their appreciation of the high quality of his work over the past twelve years.

The Publications Committee have made interim arrangements to maintain the publication of the *Journal* and are grateful to Mr. C. L. Bird and to Mr. C. O. Clark for taking over the responsibility for the papers and the abstracts respectively. A. T.

Mexican Experimental Station for Research on Cochineal (C.I. Natural Red 4)

When the use of Cochineal was at its height a century or so ago the Mexican State of Oaxaca produced nearly one million lb. per year of the dye. Nowadays with the extremely limited demand for Cochineal as a food dye and for making Carmine, Mexican production has almost entirely ceased, the limited demand being met by Peru and the Canary Islands. With the coming into force of the new regulations for food dyes there has arisen a fresh demand for Cochineal and as a result an experimental station has been set up in Oaxaca by the Musea de Artes Populares.

New Books and Publications

Handbuch für Textilingenieure und Textilpraktiker

Wuppertal-Elberfeld, Germany: Dr. Spohr-Verlag.

Teildruck T 13

Mikroskopie der Faserstoffe

By Paul-August Koch. Pp. vii + 97. 6th edition 1959. Price, DM 7.50.

The title of this little book is certainly misleading. In the first place there is no indication that it covers only light microscopy. Moreover, its main object, that of the identification of textile materials, immediately prompts at least one reader to compare it with the standard volume on this subject which is well established in this country. Even within the limited scope of light microscopy, the present reviewer does not feel justified in commending this book, since it does not make any outstanding new contribution.

It is remarkable that the section dealing with the preparation of reagents for identification is restricted, with one exception only, to a bibliography in the author's mother tongue. It is also surprising to see, in this "pocket" edition, a formal description of the light microscope and methods of illumination. Limitation of space should instead have dictated the inclusion of short notes on practical hints for using the microscope, as "probably no instrument is more misused than the light microscope".

Finally, any modern book on textile microscopy must acknowledge more clearly, than by a short paragraph and sketch, the fact that electron microscopy has now emerged as a powerful tool for the study and, with some limitations, the identification of the surfaces and fine structure of many textile fibres.

J. Sikorski

Teildruck T 15

Textilchemische Prüfungen

By Paul-August Koch. Pp. vi + 142. 6th edition 1959. Price, DM 10.00.

In their blurb the publishers emphasise that the pocket size of the book is not a sign that it lacks anything which might be expected in a book of larger pages. They say also that it gives a clear survey of the technological bases used in running a textile concern. After noticing the nationalistic bias in the sources of material, a reader's first reaction might be that the book would be of more use in Germany than here. He would be right; yet it may have more novelty here than in Germany, for the very reason that most of the references are to German sources and few to English ones.

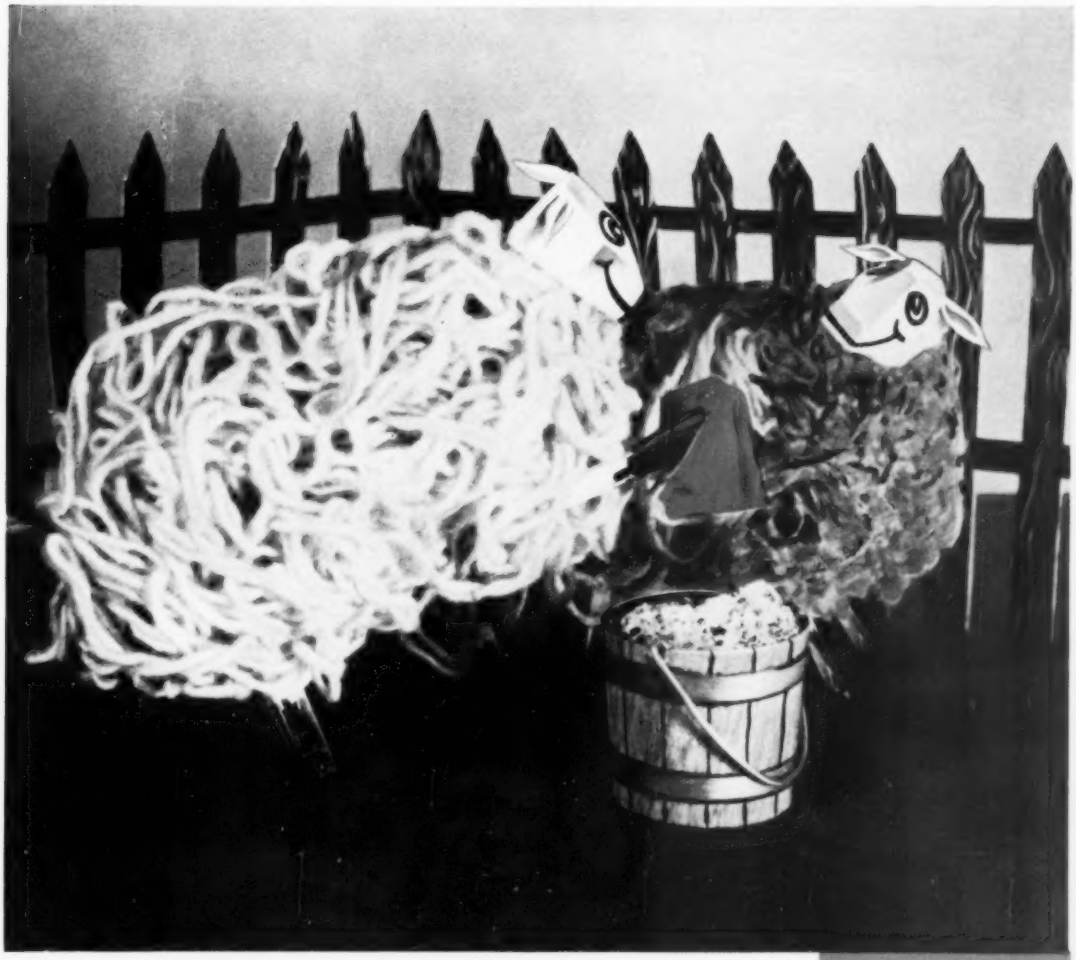
It is a neat little pocket text which covers the bread-and-butter subjects of qualitative fibre, dye, and associated material analyses and some quantitative work with fibres and pH. There is no pretence of exhaustiveness. Nevertheless, English readers may learn something, though not enough, from its perusal. They may learn something novel amongst the references to recent German publications not yet in our textbooks and in such matters as the German way of assessing fibre damage from calculated degrees of polymerisation derived from viscosities rather than from viscosities themselves.

The book is not a complete text in several respects. For example, in the section devoted to the identification of fibres, there are no microscopical directions or photomicrographs, but this is no oversight, since on p. 15 the reader is directed to consult another handbook, Fachteil T 13, *Mikroskopie der Faserstoffe* (reviewed above).

In a similar way, the directions for carrying out chemical tests are scanty. An example of the last is in the test for reducing sugars on p. 122, where there is no indication of the difficulties of the test or how they are to be overcome. Because of its weaknesses in detail and in range, the book can be used satisfactorily neither as a reference book nor as a laboratory manual. Nor does the book present a critical appreciation or a philosophy of its subject-matter, except for the philosophy inherent in its traditional mode of presentation.

Doubtless, in Germany the textile technologists and technicians who use the book have had its text supplemented by oral and practical instruction, so that for them it is a useful *aide mémoire*. For these it may prove valuable, and, indeed, the internal evidence is that this has been so, since it is now in its sixth edition. English readers will use the book with less enthusiasm.

J. M. Preston



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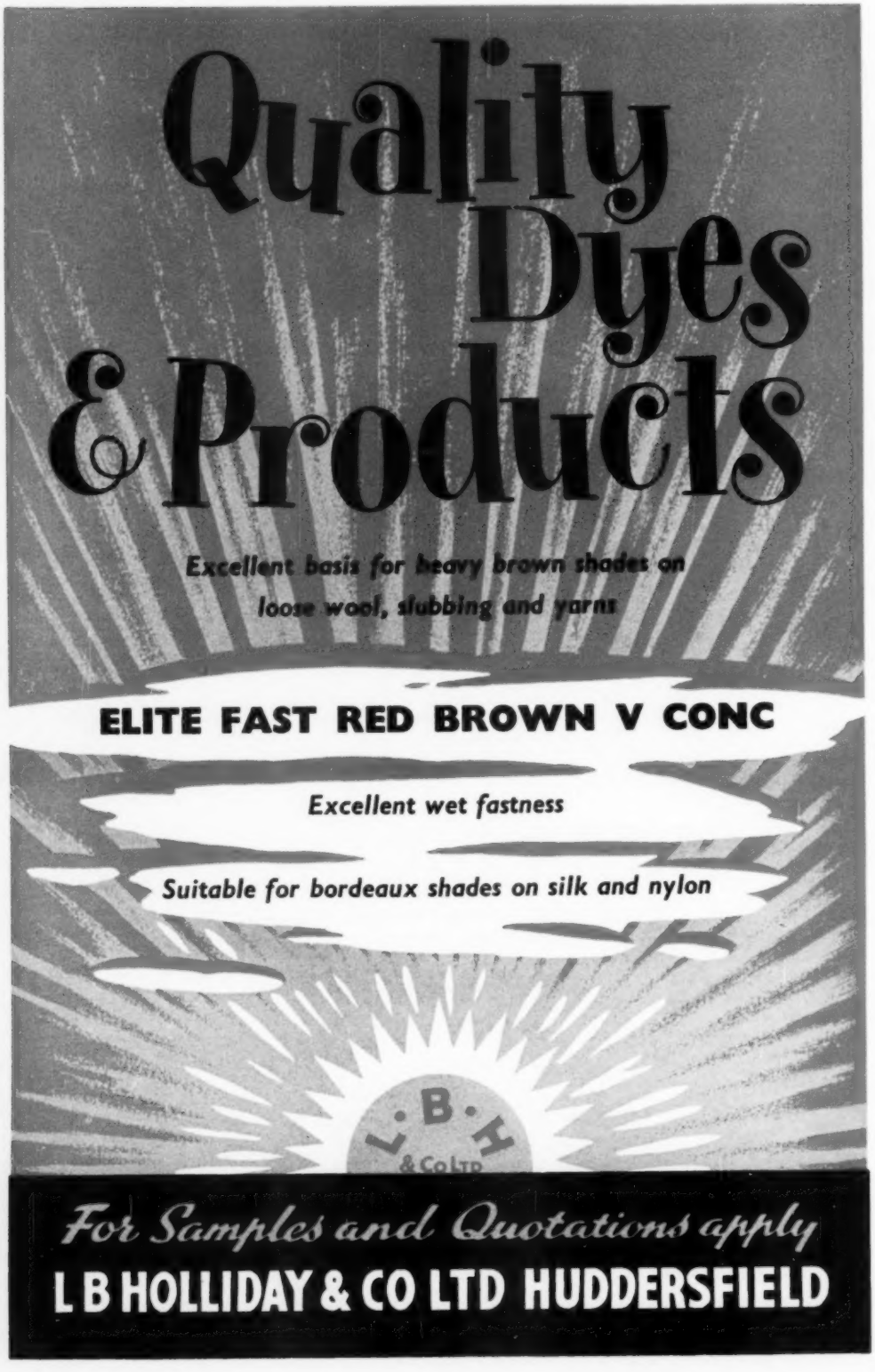
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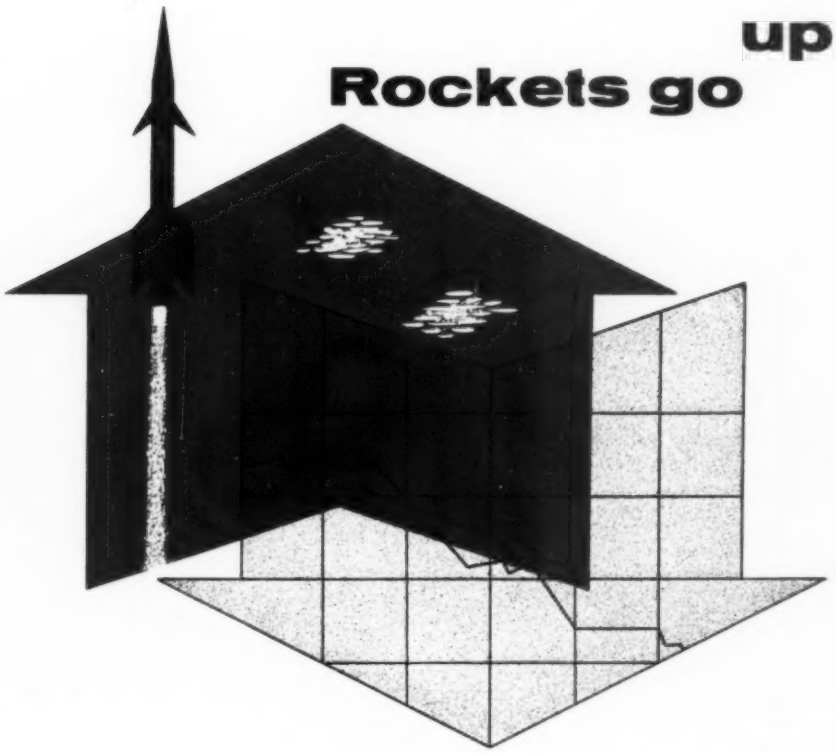

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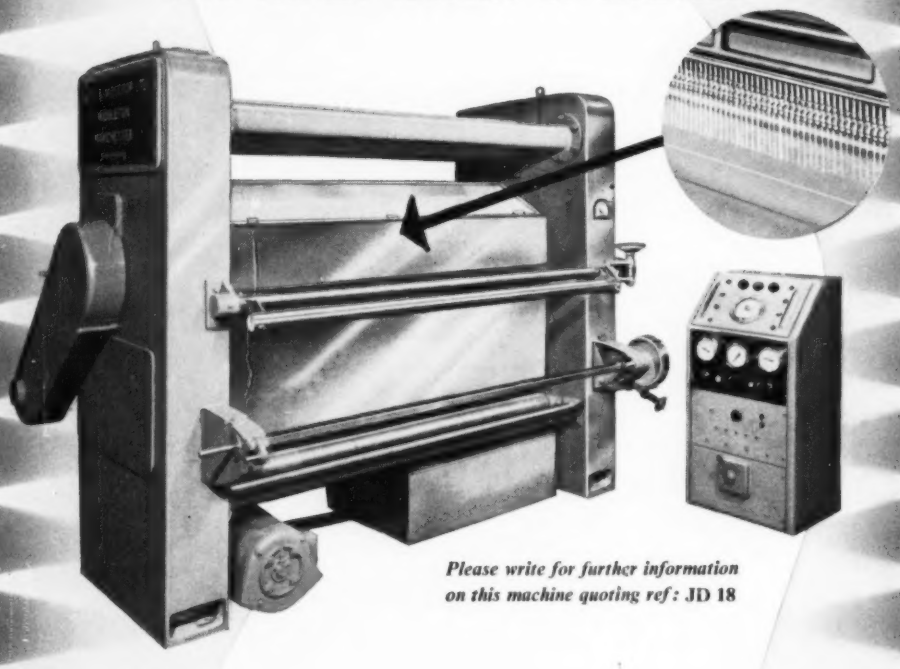

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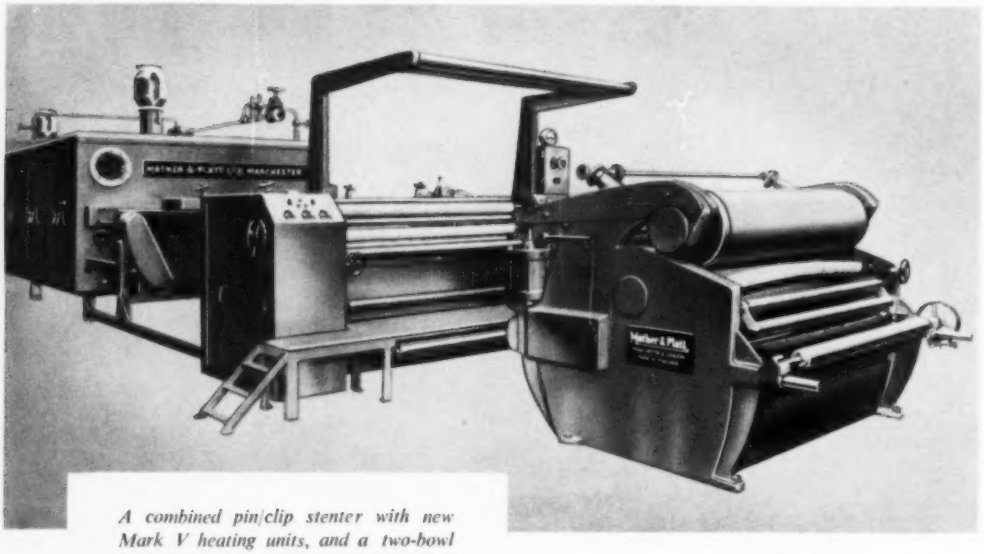

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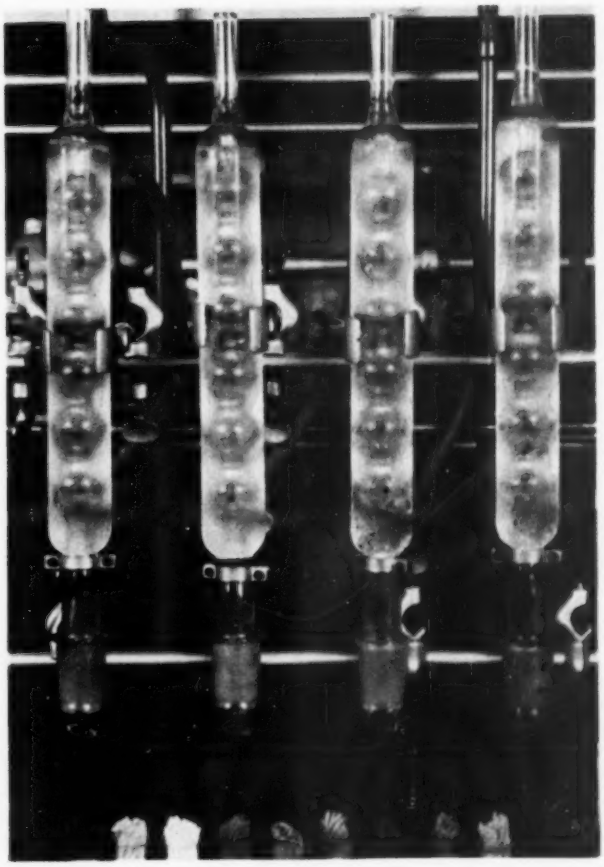

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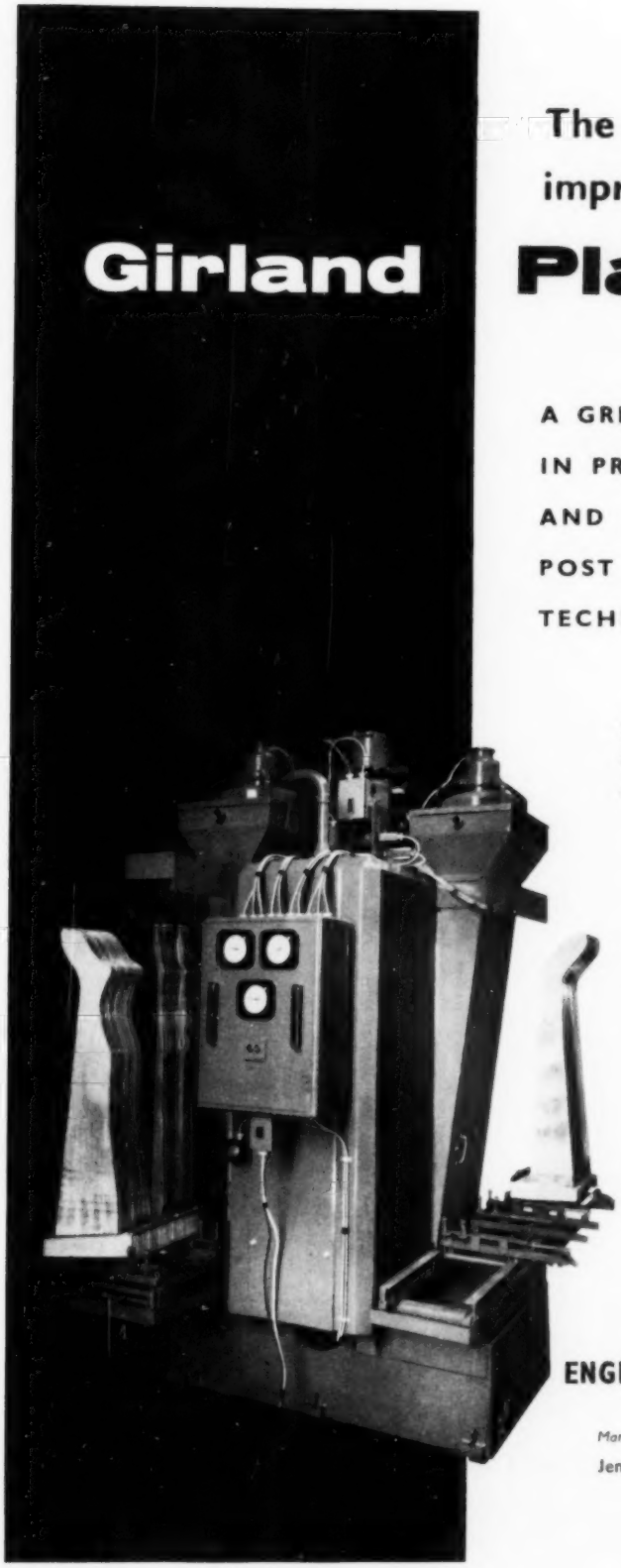

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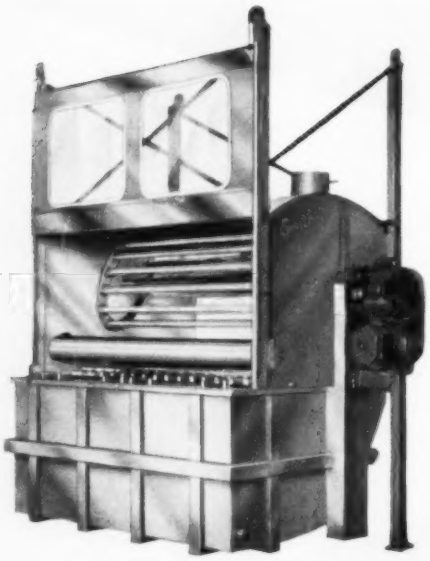

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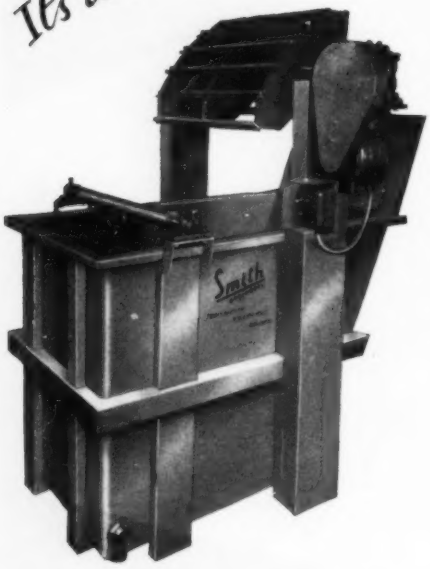

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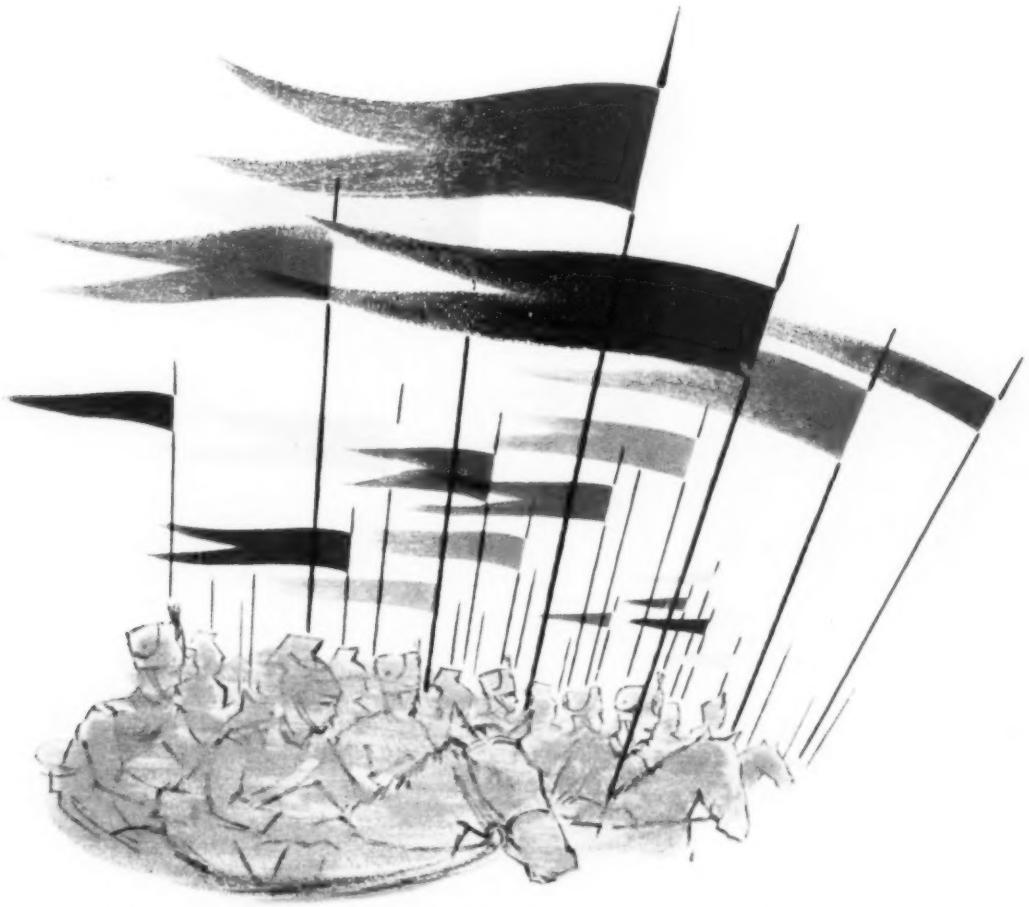

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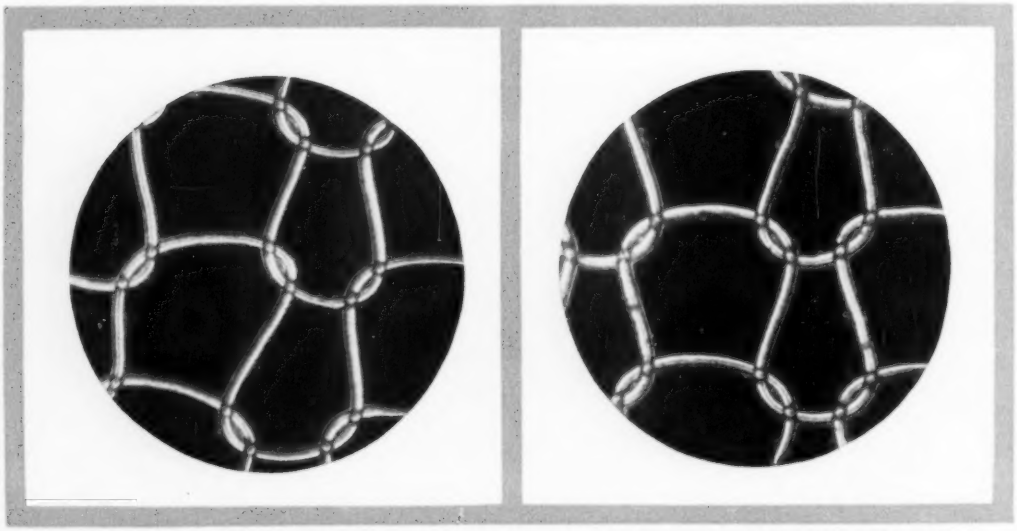

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Geigy

The Geigy Company Ltd Rhodes Middleton Manchester
A 58

Teildruck T 63
Textildruck

By K. Schmidt. Pp. viii + 113. [1951.] Price, paper DM 6.50, cloth DM 8.00.

The subject of textile printing is so vast and so complex that no single book could ever do full justice to it. Only readers in the class of experts would ever want to study the subject in such detail, however, and the present book has not been written for them but rather for those whose duties or interests require a broad knowledge of the basic principles of printing without too much of the intricacies of practice, which might tend to confuse. In this very readable little handbook the author has succeeded in producing a wonderfully concise yet comprehensive account of modern textile printing which should be of value to those concerned with related activities such as bleaching, dyeing, finishing, and the manufacture of dyes or auxiliaries. In the short space of 92 pages, printing techniques, treatment of goods before and after printing, printing pastes, and dye application are dealt with in succession.

The first section, on printing technique, covers the field adequately, and there are numerous illustrations of the machines described in the text. There is, however, little indication of the proportionate extent to which the varying methods are in present-day use.

Treatment of goods before printing is rightly dealt with very briefly, but proper attention is given to aftertreatment. The numerous illustrations of steamers are useful, and serve to emphasise the importance of steaming in print fixation.

The preparation and properties of printing pastes form a subject for the specialist, and treatment in a handbook must necessarily be rather sketchy. The author has, however, managed to bring out the essentials in the properties which a printing paste should possess, and describes very briefly the more important thickenings. There is, however, not much guidance as to how one should select a thickening for any particular purpose. In this connection the suggested use of British gum as one of the best thickenings for chrome mordant dyes must be disputed.

The remaining half of the book is devoted to dye application, including, of course, discharges and resists. In general, this is very well done, though perhaps on the question of styles, as we understand them, the treatment is less than adequate. Each dye class is dealt with in turn, and where appropriate, methods of discharging and resisting are outlined. What is lacking, perhaps, is information relating to prints where members of two or more dye classes may be used to reproduce the design.

It is to be regretted that this handbook is not more up to date. While it is as yet perhaps too early to expect a textbook which includes information on reactive dyes, one could reasonably expect a new textbook to make some mention of the phthalocyanine dyes, the "onium" dyes, and the neutral-steaming Rapidogen dyes.

Taken as a whole, this is an excellent book despite certain limitations. There are a good index and useful addenda in the shape of a bibliography of books on textile printing and lists of machinery makers and of dye and auxiliary manufacturers.

W. S. MILLER

Recent Advances in the Chemistry of Cellulose and Starch

Edited by J. Honeyman. Pp. viii + 358 with 98 figures. London: Heywood & Co. Ltd. 1959. Price, 60s. 0d.

The science and the technology of textiles have been dominated during the past thirty years by the increasing detail and accuracy of knowledge about the two chief fibre-substances, cellulose and keratin. Even when, with more recent synthetic fibres, the constitutional analogies are not very close, the chief working concepts that have inspired invention and production have originated from these natural fibres.

Although keratin is truly protean, because of the structural variety and reaction possibilities of its building-units, and so presents the investigator with problems of great complexity, these problems are made easier by the presence of many distinctive landmarks in structure and behaviour. Cellulose, on the other hand, has equally difficult problems that may be obscured by an appearance of chemical simplicity.

From the late twenties, when molecular constitutions were tentative, and fine structure largely hypothetical, there has been an enormous activity in cellulose science, and, in the last few years particularly, an increase in the tempo of discovery, especially concerned with efforts to fill up some of the more persistent gaps in the chemistry (e.g. oxidation mechanisms and molecular transformations) and the physics (e.g. problems of crystallinity) of both natural and manufactured cellulosic fibres. An up-to-date guide to these developments was urgently needed, and, on the whole, it is more convenient that this guide should be confined to recent work and views rather than that it should form an addition to a new issue of a standard textbook. The present work is based on a series of post-advanced lectures given at Manchester, and has all the merits and some of the defects natural to a symposium volume. The merits are far more evident in this case. Of the twelve chapters, six are devoted entirely to cellulose, five to common features in cellulose and starch, although even in these, more is said about the former than the latter, and one to starch alone. Because each has been written by an acknowledged expert in the particular subject, the level of authority is high throughout the book, and the bibliographies are full and up to date.

A book of this kind can reflect the organisation of the original lecture course, and with this in mind, it is difficult to think of a more acceptable range of subject-matter, or a happier choice of participants. Good editing, while preserving the necessary connections between chapters, has reduced undesirable repetition to a minimum. There is, inevitably, some disproportion between treatments in the different chapters, but this is not gross, nor does it detract materially from the complete effort.

The first chapter, a general introduction to the chemical constitution and reactions of carbohydrates, should be the most important because it forms the key to much particular detail in later chapters, and because recent developments, unfamiliar to many, have been so considerable. It is, however, the most disappointing, not because information is inadequate, but because it is too compressed and so makes the subject, intrinsically complex, even harder to follow. The difficulty is increased because it has unfortunately been decided to collect most of the structural formulae, which illustrate the whole discussion, at the end of the chapter. This may be convenient in a three-page paper, but it is annoying in a long chapter of a book, and should be discarded when the chapter is properly expanded in future editions.

For a textile chemist, especially one who has been able to see the growth of cellulose chemistry from modest origins, the most interesting chapters are probably those on degradation mechanisms (Dr. Nevell and Dr. Corbett), and, for the fibre scientist, those on fine structure (Dr. Marrinan) and mechanical properties (Professor Meredith).

From the biological point of view, the main function of cellulose is structural, as that of starch is metabolic (the static as compared with the dynamic purpose). So, in our own subjects, the industrial uses of cellulose, as distinct from some of its derivatives, are for permanent ends as compared with those of starch for temporary ones. Thus the incorporation of starch lore (except for purposes of comparison) into a treatise that has so much to say about cellulose is not easy. Of the two chapters that are devoted largely to starch, the one which deals with industrial uses goes more deeply into technology than any corresponding one for cellulose. One feels that, in comparison with the latter, starch science and technology, though far from negligible, have still a good way to go. Perhaps the most stimulating chapter intellectually is that on enzymic synthesis and degradation by Dr. Whelan, since it holds so many exciting possibilities for the future.

The price is very reasonable for a book of such value and significance.

H. A. TURNER

Dizionario tessile laniero
inglese–italiano
italiano–inglese

Pp. 160. Schio (Vicenza): Lanerossi. [1958.] Price, lire 300.

This little booklet seems to be intended mainly to assist Italian technologists to read the American and British technical literature, since the English–Italian part occupies 126 pages, whereas only 22 pages are devoted to the Italian–English section. In the former the vocabulary has not been selected on a narrow wool basis, as a number of general terms are included, as also those associated with related technologies and other fibres.

A particularly meritorious feature is that care is taken to explain the different meanings of a word, so that the user is left in no doubt as to which equivalent is appropriate in a given context: he is not left, as with so many small bilingual dictionaries, to take his pick among a group of quite unrelated terms. This clarification is further helped by listing a number of compound terms under each simple word. Thus under *shade* (noun) the three meanings— partial darkness, colour, and slight difference of colour— are clearly distinguished.

The reviewer has noticed one rather misleading entry: the Italian for *solidity* is given as "solidità", and for the "solidity of dyes and prints" there is a cross-reference to *fastness*. But the solidity of a dyeing (hardly of a print) is very different from its fastness.

C.J.W.H.

Manufacturers' Publications and Pattern Cards

The Society does not accept any responsibility with regard to the statements in the following notes.
Any publication abstracted may be referred to by members of the Society on application to
Dr. C. B. Stevens, Dyeing Department, Leeds University

Ciba Ltd.

CIBACROLAN BLUE 8G: CIBACROLAN GREEN VM— These are the first two of a new range of reactive dyes for wool on which they give greenish blues and bluish greens, respectively, of high fastness to wet treatments. They are applied in presence of acetic acid and Neovadine AN or AL at the boil, ammonia equal to about ½ the amount of acetic acid (40%) used being added after 30–60 min. boiling and dyeing continued for a further 15–30 min. in the cooling liquor to promote the return of chemically uncombined dye to the dyebath. They can be combined with other Cibacron dyes particularly to give redder or greener blues and greens.

CIBACROLAN BLUE 8G— Light (daylight) 5, washing SNV, B 4–5, alkaline milling severe SNV 4–5.

CIBACROLAN GREEN VM— Light (daylight) 5, washing SNV, B 4–5, alkaline milling severe SNV 4–5.

CIBACRON BRILLIANT BLUE BR— This reactive dye gives bright, reddish blues when dyed or printed on cellulosic fibres. Colourings have good fastness to light, washing and peroxide bleaching and may be resin-finished, rubberised or PVC coated. It is applicable by both pad-dyeing and batchwise exhaustion methods, alone and in mixtures with other Cibacron dyes. It is also of interest on wool. Fastness figures on cotton include— Light (Fadeometer) 7, washing SNV, C 4–5, perspiration SNV 4–5.

CIBACRON BROWN 3GR— This reactive dye gives bright orange browns when dyed or printed on cellulosic materials. It may be applied by both pad-dyeing and exhaustion methods, alone and in mixtures, and dyeings and prints may be resin-finished, rubberised or PVC-coated without detriment to the colour fastness. Dyeings are dischargeable to white in pale to medium depths. Fastness figures on cotton include— Light (Fadeometer) 6, washing SNV, C 4–5, perspiration SNV 4.

CIBACRON VIOLET 2R— This reactive dye gives very red violets when dyed or printed on cellulosic fibres. It may be applied by pad-dyeing or batchwise exhaustion methods, alone and in mixtures, and gives colourings of the same high standard of fastness as the other members of the range. Fastness figures on cotton include— Light (Fadeometer) 6, washing SNV, C 4–5, perspiration SNV 4–5.

CIBACET SCARLET B— This disperse dye is of interest for dyeing and printing polyester and polyacrylonitrile

fibres, secondary cellulose acetate and triacetate but not polyamide fibres. Colourings have good fastness to light and wet treatments, very good fastness to sublimation and burnt gas fumes. Dyeings on secondary acetate and triacetate are dischargeable to white. Fastness figures on polyester fibres include—Light (daylight; high temperature dyeing) 5, steaming (sat. steam, 105°C. 30 min.) 4–5, washing SNV, B 4–5.

CIBACET BROWN 3R—This disperse dye gives reddish browns when dyed and printed on polyester fibres and secondary cellulose acetate rayon and triacetate. Colourings have very good fastness to sublimation and high light fastness especially in pale depths on secondary acetate and triacetate. Dyeings on these last two fibres are dischargeable to white. It is not recommended for polyamide and polyacrylonitrile fibres.

CIBALAN BORDEAUX EL—This neutral-dyeing metal-complex dye gives dyeings on wool similar in hue to the GRL brand but has superior level-dyeing properties. The fastness properties of dyeings are of the same high standard as those of the other Cibalans, the light fastness being particularly high even in pale depths. It is recommended for dyeing wool, silk and polyamide fibres at all stages of manufacture and for Vigoureux and direct printing. Fastness figures on wool include—Light 7, alkaline milling ECEb 5, washing ECEb 5.

Ciba Clayton Ltd.

CIBACET DYES ON SECONDARY ACETATE—This card contains dyeings on secondary cellulose acetate rayon cloth of 45 disperse dyes together with the usual data for application and fastness.

THE EFFECT OF THE W.I.R.A. PERACETIC ACID SHRINK-RESIST PROCESS ON WOOL DYES—Figures are given for the change in hue and/or depth produced when dyeings of the full range of wool dyes were treated by the shrink resist process as given in Example 2 in the Provisional Specification of *BP* 804,781 of the Wool Industries Research Association. It supplements that covering other processes given in publications C.A.C. 166 and 184.

Durand & Huguenin S.A.

CHROME COLOURS PRINTED AS EMULSIONS—This card contains 7 patterns of prints on cotton and viscose rayon produced completely, or in part, with chrome dyes using an oil-in-water emulsion thickener and either roller or screen application. Since small amounts of conventional thickenings used with chrome dyes may become fixed on the material by the mordant, the advantages of emulsion thickenings are obvious but lack of an emulsifier compatible with chromium salts has hitherto precluded their use. The introduction of Mulsoprint enables stable emulsions to be produced and bright, well penetrated prints are obtained which can be fixed by quite short steaming and washing-off times are greatly reduced. Full working details and lists of suitable dyes are given in the text.

J. R. Geigy A.G.

IRGALAN BROWN GRL—This neutral dyeing metal complex dye gives browns of excellent fastness to light, particularly in pale depths, and good fastness to wet treatments on all forms of wool, silk and polyamide fibres. A notable feature is its high solubility in water (up to 200 g./l.). It is also of interest for direct printing on wool. Fastness figures on wool include—Light 7, washing b 4–5, alkaline milling b 4.

IRGALAN VIOLET F2BL—This neutral dyeing metal complex dye gives quite bright violets, bluer and purer in hue and of better fastness to light than the 4BL brand, on wool, silk and polyamide fibres. It is of particular interest in combination with Blue FGL for blue-greys. When dyeing without acetic acid or ammonium sulphate it is advisable not to exceed 90°C. to ensure maximum brightness of hue. Fastness figures on wool include—Light 7, washing b 4–5, alkaline milling b 4.

SOLOPHENYL BRILLIANT GREEN 2GL—This direct dye is similar to the 5GL brand but more soluble, which makes it more suitable for padding, exhausts more rapidly and has lower migrating power. The hue on cotton is rather bluer and on viscose rayon much bluer than the 5GL brand and dyeings are less affected by crease-resist (urea formaldehyde) finishing and, on viscose rayon, are much faster to water spotting. Fastness figures on cotton include—Light 5–6, perspiration 2–3, washing a (40°C.) 3.

SOLOPHENYL BLUE AFGL—This fast-to-light direct dye is recommended for dyeing all forms of cellulosic fibres. It is very level dyeing and covers irregular-dyeing viscose rayon well. Crease-resist finishing has a negligible effect on hue and light fastness. Acetate rayon is reserved white and wool in wool/cellulosic fibre mixtures is dyed less deeply than the cellulosic portion. It is also of interest for direct and discharge printing. Fastness figures on viscose rayon include—Light 6–7, washing a 3, perspiration 3.

SOLOPHENYL GREEN A2GL—This fast-to-light direct dye is recommended for dyeing all types of cellulosic material but, as indicated by the designation "A", particularly when using a urea–formaldehyde type crease-resist finish is to be applied. It is the first true green in this range suitable for this purpose. The wet fastness of pale depth dyeings is very good and that of deep dyeings can be improved by aftertreatment with Tinofix. Dead cotton is well covered and acetate rayon completely reserved. It is also suitable for direct and discharge printing. Fastness figures on cotton include—Light 6–7, washing a (40°C.) 3–4, perspiration 2–3.

SOLOPHENYL ORANGE ARL—This fast-to-light direct dye is a new member of the "A" range of dyes suitable for use on cellulosic materials subsequently to be crease-resist finished. Dyeings of good wet fastness are obtainable in pale depths without aftertreatment and in full depths by aftertreating with Tinofix. It has very good neutral and alkaline dischargeability and its outstanding light fastness makes it particularly suitable for furnishings. Fastness figures on cotton include—Light 7, washing a (40°C.) 3, perspiration 3.

Abstracts from British and Foreign Journals and Patents

The titles of abstracts may be modified. Abbreviations of names of firms are listed in J.S.D.C., **68**, *23 (Jan. 1952), and also, together with symbols and the periodicals abstracted, in the annual index*

I—PLANT; MACHINERY; BUILDINGS

PATENTS

Carbon Black Apparatus
F. C. Reed *USP* 2,877,717
USP 2,878,104

Apparatus for producing high yields of a pigment having many of the characteristics of Channel Black (C.I. Pigment Black 7). C.O.C.

Recycle Apparatus for Carbon Black Pellet Mills
Phillips Petroleum Co. *USP* 2,876,490

Dyeing or Wet Processing of Fibrous Materials
B. C. Bond *USP* 2,876,063

Modification of *USP* 2,441,308 (J.S.D.C., **65**, 27 (1949)). The material passes between two submerged perforated headers from which the liquor is forced under pressure on to the face and back of the material at right angles to its direction of travel. Excess liquor is withdrawn from the bath and returned to the headers, this liquor being withdrawn in equal amounts from both sides of the material in the centre of the bath and at right angles both to the direction of travel of the cloth and to the direction of the liquor being forced on to the material from the headers. C.O.C.

Wet Treatment of Fibrous Material
Courtaulds *BP* 816,674

The fibrous material is placed in a trough having a perforated bottom. This trough is suspended in a bath of the treating liquor in which it moves to and fro. The level of the liquor is also regularly varied so that when the trough

is in its forward position the material is raised from the perforated bottom to which it returns when the trough is in its rearward position. C.O.C.

Raising Machine
Etablissements Albert C. Scholaert *BP* 816,441
Machine embodying an improved device for limiting the tension in the fabric as it leaves the raising cylinder. C.O.C.

Processing Pile Fabrics Made From Heat-shrinkable and Non-shrinkable Yarns
Collins & Aikman Corpn. *USP* 2,875,504
Apparatus which effects linear contraction of the heat-shrinkable yarns in the pile without appreciably affecting the tips of pile of non-shrinkable yarns and without stiffening or hardening either the pile or the base fabric. C.O.C.

Coating Travelling Webs
Beloit Iron Works *USP* 2,874,674
In a coating machine having a relatively rigid large platen roller and a small flexible doctor roller the latter is loaded by means of one or more members presenting a resilient surface slidably engaging the back side of the doctor roller. Fluid pressure means work on the back side of the resilient surface to ensure that the doctor roll exerts uniform pressure against the platen roll throughout its length. C.O.C.

Coating and Impregnating Tubular Fabrics
National-Standard Co. *USP* 2,874,411

Impregnating Carded Laps
West Point Manufacturing Co. *USP* 2,877,739
Machine in which the carded laps assembled to be made into a bonded fibre fabric are passed through the impregnating liquor on a foraminous endless belt. Special means of mounting the belt are described which ensure that the tank shall only be as wide as the fibre web being carried through it, and that the belt is readily removed so that the machine can be cleaned. C.O.C.

II—WATER AND EFFLUENTS

PATENT

Treatment of the Effluent from Sulphur Dye Baths
J. B. Story *USP* 2,877,177
Sulphur dye waste liquors can be deodorised, decolourised, neutralised, etc. by treatment with aqueous H_2SO_3 or other SO_2-containing compound. The two liquors must be quickly mixed and the strength of the sulphurous acid should be such that H_2SO_3 : alkali sulphide :: 0·5–4·1 : 1. Thus waste from a sulphur dye bath of pH > 11 was treated with sufficient H_2SO_3 to bring to pH 6·8 immediately after adding the acid. The liquor was allowed to settle, giving a clear neutral supernatant liquid, suitable for discharge into a sewer, and a black curdy precipitate which was re-dissolved with Na_2S and re-used for dyeing. C.O.C.

III—CHEMICALS; AUXILIARY PRODUCTS; FINISHING MATERIALS

List of Textile Auxiliaries
J. C. Espector Y. *A.Q.T. Boletín Técnico Informativo*, 1, 43–54 (Dec. 1958)

PATENTS

Increasing the Detergency Value of Nonionic Detergents
Dan River Mills *USP* 2,876,201
Addition of a builder, e.g. Stymer S (Monsanto) (Na salt of styrene-maleic anhydride copolymer) and as base, ammonia or an organic amide, gives increased detergency value to nonionic detergents when used at pH 10 or above. As the pH decreases from 10 the detergency value decreases. Inorganic bases, e.g. phosphates and carbonates, impair the building properties of Stymer S. C.O.C.

Ampholytic Compositions in Wet Processing
General Aniline *USP* 2,877,178
Compositions containing an ampholytic compound of formula—

$$R^1{\cdot}CO{-}\left[NR^2{\cdot}R^3\right]_n{-}NR^4R^5{\cdot}COOH$$

(R^1 = Alk of > 7 C; R^2 and R^4 = H, Alk, hydroxyalkyl, hydroxyalkoxyalkyl, and hydroxypolyalkoxyalkyl; R^3 = alkylene of 2–6 C; R^5 = alkylene of 1–4 C; n = < 1) and 4–300% (on the weight of the ampholytic compound) of a nonionic surface compound of formula—

$$R^6{\cdot}(CH_2CH_2O)_m{\cdot}H$$

(R^1 = alkylphenyoxy or alkoxy; m = > 3), e.g. a mixture of $C_{17}H_{35}CO{\cdot}NH{\cdot}CH_2{\cdot}CH_2{\cdot}N(C_6H_4OH)CH_2COOH$ and the condensate of 1 mol. nonylphenol with 8–25 mol. ethylene oxide, are stable to acids, alkalis and hard water. They have good wetting, dispersing and detergent properties and have a wide range of uses as textile assistants and auxiliary agents. C.O.C.

Preventing Wicking of Oil from the Jute Backing into the Pile of Carpets or Rugs, Yarns and Fibres
Atlantic Industries *USP* 2,876,141
Addition of a waxy softener, e.g. Sapamine(trimethyl-β-oleamidoethylammonium sulphate) or Ahcovel A or R (Arnold, Hoffman & Co), to the batching oil used in spinning the jute inhibits it wicking into the pile of carpets in which the jute forms the backing. C.O.C.

Softening and Anti-static Agents for Textiles made from Hydrophobic Fibres
Arnold, Hoffman & Co. *USP* 2,878,144
Quaternary ammonium salts of fatty acid esters of polyhydroxyalkyl alkylene polyamines of formula—

$$\left[(R^1OR^2)_2{\cdot}NM{\cdot}R^3{\cdot}N(R^3OR^1)_2\right]_z^{+}X^-$$

or

$$\left[(R^1OR^2)_2{\cdot}NM{\cdot}R^3{\cdot}NM{\cdot}(R^3OR^1)_2\right]_z^{++}2X^-$$

or

$$\left[(R^1OR^2)_2{\cdot}NM{\cdot}R^3{-}\left(N(R^3OR^1){\cdot}R^3\right)_n{-}N(R^3OR^1)_2\right]_z^{+}X^-$$

or

$$\left[(R^1OR^2)_2{\cdot}NM{\cdot}R^3{-}\left(N(R^3OR^1){\cdot}R^3\right)_n{-}NM{\cdot}(R^3OR^1)_2\right]_z^{++}2X^-$$

(R^1 = same or different, H or aliphatic acyl of 12–18 C, at least one R^1 being acyl; R^2 = same or different alkylene of 2–4 C; R^3 = same or different alkylene of 2–6 C; M = same or different CH_3, C_2H_5, propyl, isopropyl, butyl or isobutyl; X = sulphate, halide, benzene sulphonate, toluene sulphonate, borate or phosphate ion; z = valence of X; n = 1–3; in the first two formulae when R^2 = ethylene then at least one R^2 has 3–4 C), e.g. the mono-quaternary salt prepared from *NNN'N'*-tetrakis(β-hydroxyethyl)hexamethylenediamine-1,6-tristearate and dimethyl sulphate, are very good antistatic and softening agents for cellulose acetate, nylon, vinyl resins, etc. C.O.C.

Compositions for Rendering Synthetic Films and Fibres Non-adherent, Heat-sealable at Low Temperatures, and Antistatic
W. C. Ware *USP* 2,876,127
Nylon, Terylene, polyethylene, vinylidene chloride–vinyl chloride copolymer, etc. films and fibres are treated with aqueous dispersions of octyl or nonyl phenol condensed with 12 or 13 mol. of ethylene oxide and a quaternary ammonium salt containing three CH_3 groups and Alk of 8–18 C, e.g. alkyltrimethylammonium chloride (Alk from soya or coconut fatty acid), there being 5% of the first and 0·5% of the second component in the dispersion. The treated fibres or films do not tend to adhere to one another and have good antistatic properties. The films are heat-sealable at temperatures which do not destroy the orientation of the molecules. C.O.C.

Size for Nylon
Nopco Chemical Co. *USP* 2,876,205
A blend of (1) a water-soluble, low-mol.wt. organic, hydroxy or polyhydroxy acid, e.g. glycollic acid, (2) a water-soluble low-mol.wt. aliphatic amide, e.g. formamide and (3) a water-soluble polyhydroxyalcohol, e.g. diethylene glycol, is an excellent plasticiser for sizes for nylon, e.g. polyacrylic acid. C.O.C.

Size for Polyester Yarns
Dow Chemical Co. *USP* 2,875,099
A mixture of polycarboxylic acid compounds, e.g. those obtained by the oxidation of coal, plastified by a soluble solvent, e.g. water, is a good size for polyester fibres. C.O.C.

Divalent Metal Acrylates as Thickening Agents for Aqueous Dispersions
Rohm & Haas Co. *USP* 2,875,166
Ca, Mg, Sr, Zn or Ba acrylate is added to the dispersion together with a catalyst or polymerisation initiator, e.g. acetyl peroxide or NH_4 persulphate, and then polymerised to effect the desired thickening. C.O.C.

Water-repellent Silicon Compound
Lockheed Aircraft Corpn. *USP* 2,877,201
The products obtained by treating a halogenosilane or halogenosiloxane with a polyfunctional polyazine are water-repellent agents of good resistance to common solvents. Thus a mixture of diethyl dichlorosilane (1 mol.), hydrazine (1·5 mol.) and ligroin (20 parts by wt. to 1 part by wt. of the other two components) is stable. On being sprayed or brushed on to a surface and then dried it yields a very durable water repellent coating having excellent adhesion to practically all surfaces. C.O.C.

Polyesters as Ultraviolet Absorbents
Eastman Kodak Co. *USP* 2,875,053
Polymerised monoethylenically-unsaturated compounds to which are attached through an ester or amide linkage a compound of maximum absorption between 260–400 mμ. and which are non-absorbent between 400–700 mμ., e.g. an ester of polyacrylic anhydride and 3-ethyl-5-*p*-(β-hydroxyethoxy)benzal-2-phenylimino-4-thiazolidone are excellent ultraviolet absorbents for use in colour photography. C.O.C.

Stabilised Acrylonitrile Polymers (VI p. 504).
1,3-Diamino-2-propanol Tetraacetic Acid as Stabiliser for Developers used in Colour Photography (IX p. 506).

IV—RAW MATERIALS; INTERMEDIATES; COLOURING MATTERS

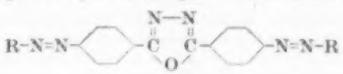
Colloidal State of Dyes and their Metachromatic Properties
M. V. Savost'yanova and L. G. Matsinova
Doklady Akad. Nauk S.S.S.R., **125**, 1294–1297 (21 April 1959)
The absorption spectra (400–700 mμ.) of Methylene Blue (I), Fuchsine, Crystal Violet, and Cyanine have been determined (*a*) in colloidal dispersion (in benzene), and (*b*) in aq. soln. in the presence of agar-agar. From the positions of the absorption max. in the two systems a colloidal nature is assigned to the agar-containing soln. and the particle size (ca. 20 mμ.) is derived. In the case of I, variations in temp. and in dye and agar concn. for (*b*), and the standing times and compositions for (*a*) are tabulated. G.J.K.

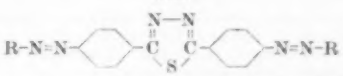
Silver-Nitrogen Compounds in the Reaction of Pishchimuka
I. O. Pishchikov *Ukrain. khim. zhur.*, **25**, 99–101 (1959)
Silver-nitrogen salts (I) of amides and imides can react with aniline in the presence of Se, in analogy to mercury-nitrogen compounds (II) (P.S. Pishchimuka, *Zhur. obshch. khim.*, **10**, 305 (1940); **21**, 1689 (1951)) to yield dyes, and in some cases also azo cpd. (III). The yield of III is greater with II than I, with the exception of the toluene sulphamide salt. II are more stable than I but are less reactive. G.J.K.

Formation of Sulphones in the Reaction of Sulphinic Acids with Azo Compounds and Azines
W. Bradley and J. D. Hannon
Chem. and Ind., (17), 540 (25 April 1959)
Azo compounds when refluxed in ethanol with arylsulphinic acids yield azo-sulphones (e.g. I). Under different conditions the same reactants yield hydrazo compounds (II) and it is considered that I arises from II by migration of *N*-arylsulphonyl groups. Similarly, phenazine and benzene sulphinic acid yield 2-(phenylsulphonyl)phenazine and evidence is adduced that this compound also arises via a nitrogen to nucleus migration of the benzene sulphonyl group.

(I) (II)
A.J.

Direct Disazo Dyes, Oxadiazole, and Thiodiazole Derivatives
N. S. Dokunikhin, B. M. Krasovitskiĭ, R. M. Matskevich, V. A. Blinov, and Z. Ya Bitokhina
Zhur. priklad. khim., **32**, 664–667 (March 1959)
Two types of dyes of the general formulae—



and


were produced in which R is 1,8-aminonaphthol-3,6-disulphonic acid or 1,8-aminonaphthol-2,4-disulphonic acid. The coupling is done in an alkaline medium brought about by Na_2CO_3. These dyestuffs are of the direct type and produce various violet shades on cellulosic materials. Their fastness properties to water, soap and perspiration are greatly improved by the aftertreatment with the dicyandiamide–formaldehyde condensation product alone or with the addition of $Cu(O{\cdot}CO{\cdot}CH_3)_2$. T.Z.W.

Sensitised Oxidation of the Methylene Blue Leuco Base on Radiolysis in Aqueous Solution
A. A. Zansokhova and V. D. Orekhov
Doklady Akad. Nauk S.S.S.R., **125**, 838–840 (1 April 1959)
Carefully prepared samples of the Methylene Blue leuco base (I) are exposed to γ-radiation (Co^{60}) in the absence and in the presence of the nitrate ion (II). It is found that II sensitises oxidation of I. max. oxidation occurring at pH < 2·5. Action of II is attributed mainly to the immobilisation of hydrogen atoms and the subsequent oxidation of the leuco form by free hydroxyl. G.J.K.

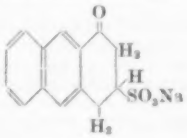
Quinones
A. N. Grinev, V. N. Ermakova, and A. P. Terent'ev

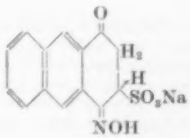
XXIV—Isomerisation of the Adducts of *p*-Quinones with Diene Hydrocarbons
Zhur. obshch. khim., **29**, 86–89 (Jan. 1959)
A new preparative method for the isomerisation of the adducts of *p*-quinones with diene hydrocarbons into substituted hydroquinones is described, and the preparative conditions and properties of 11 hydroquinones tabulated.

XXV—Synthesis of Naphthaquinones and Dihydroanthraquinones
Ibid., 90–92
The reactions of *p*-benzoquinone, 2,3-dichloro-*n*-benzoquinone with diene hydrocarbons yield 5-methyl-, 6-methyl-naphthaquinone, and 2,3-dichloro-naphthaquinone. Oxidation of 6,7-dimethyl-5,8-dihydronaphthahydroquinone yields 6,7-dimethylnaphthaquinone. The preparation of 5 anthraquinone derivatives by oxidation of the corresponding hydroquinones with $KBrO_3$ in acid soln. is described. G.J.K.

Hydroxy Derivatives of Anthracene
S. V. Bogdanov and M. V. Gorelik

I—Bisulphite Compounds of 1-Anthrol and 4-Nitroso-1-anthrol
Zhur. obshch. khim., **29**, 136–139 (Jan. 1959)
The hydroxylamine, semicarbazide, and phenylhydrazine derivatives of the bisulphite compounds of 1-anthrol (I), and the hydroxylamine derivative of the bisulphite compd. of 4-nitroso-1-anthrol (II) have been prepared and described.



(I)


(II)

II—Bisulphite Compounds of 1-Nitroso-2-anthrol

Ibid., 140–145

The hydroxylamine derivative of 1-nitroso-2-anthrol (III) has been prepared and its reaction products with $SnCl_2$ (giving 1-amino-2-anthrol-4-sulphonic acid) NaOH and nitric acid have been prepared and characterised spectrophotometrically (220–500 mμ.). The chemical transformations of III are shown schematically.

III—Transformations of the Bisulphite Compound of 1,2-anthra-(3′,4′)-furoxane

Ibid., 146–153

Under alkaline conditions the bisulphite compd. of 1,2-anthrafuroxane is rearranged to 2-nitro-1-anthramine-4-sulphonic acid (IV) (mild alkali) and 1,2-anthraquinone-dioxime-4-sulphonic acid (strong alkali). IV when heated with (*a*) 50% sulphuric acid gives 2-nitro-1-anthramine, (*b*) further alkali gives 2-nitro-1-anthro-4-sulphonic acid. The products of reduction with $SnCl_2$ and subsequent oxidation with SeO_2 are also described. Absorption spectra in alcohol are given. G.J.K.

Effect of the Conjugation of the Anthracene Nucleus with a Double Bond in an Alkenyl Substituent upon Fluorescence and Absorption Spectra

A. S. Cherkasov

Doklady Akad. Nauk S.S.S.R., **125**, 848–851 (1 April 1959)

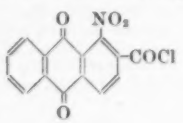
Fluorescence and absorption spectra of 9,10-di-*n*-propyl-; 9,10-diallyl-; 9-*n*-prop-1′-enyl-; 9,10-di-*n*-prop-1-aryl-; 9-ethyl-; and 9-vinyl derivatives of anthracene in alcohol have been investigated. It is found that the presence of double bonds in the substituent (I) in a conjugated position with respect to the anthracene nucleus (II) causes interaction of the respective π electrons of I and II, even in the absence of coplanarity in the conjugated system. The greater value of the fluorescent spectra for structural work is stressed. G.J.K.

Dyes for Acetate Rayon and Synthetic Fibres
II—Disperse Dyes—Derivatives of 1-Alkylamino-anthraquinone-2-carboxylic Acid

L. D. Dashevskaya and V. N. Ufimtsev

Zhur. obshch. khim., **29**, 285–287 (Jan. 1959)

The reactions of (I) with some aliphatic amines and



(I)

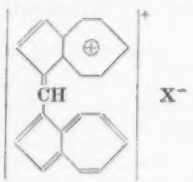
piperidine have been studied and pink and red dyes obtained. Primary amines and piperidine react with both the –COCl and $-NO_2$ groups, whilst diethylamine reacts with the –COCl group only. The diethylamide of I can react with primary aliphatic amines, exchanging its $-NO_2$ group for a monoalkyl amino group. G.J.K.

New Derivatives of Azulene

F. N. Stepanov and N. A. Aldanova

Zhur. obshch. khim., **29**, 339–340 (Jan. 1959)

The preparation of a cationic dyestuff (I), where



(I)

X = ClO_4, or Cl, is described, the chloride being soluble in alcohol and water, and decomposing above 200°c. The absorption spectrum in alcohol has a max. at 617 mμ; the deeply coloured soln. can be reversibly discoloured by alkali. Attempts to recrystallise the dye base (m.pt. 73–76°c.) have been unsuccessful due to ready polymerisation. G.J.K.

Thioindigo Dyes from Ethylbenzene, iso-Propylbenzene, and Tertiary Butylbenzene

G. M. Oksengendler and M. O. Lozinskiĭ

Ukrain. khim. zhur., **25**, 95–98 (1959)

S-aryl-, and S-bromaryl-thioglycollic acids with ethyl, isopropyl, and t-butyl radicals have been prepared and the corresponding symmetrical thioindigo dyes obtained. It is shown that the introduction of alkyl radicals in the 5,5- and 7,7-positions causes a bathochromic shift of the absorption max. by 10 mμ. and 4 mμ. respectively. The properties of the above intermediate acids and of the synthesised dyes are tabulated. G.J.K.

Separation of Anthocyanins from Plant Extracts

B. V. Chandler and T. Swain

Nature, **183**, 989 (4 April 1959)

Column chromatography on a mixture of powdered nylon and Celite allows separation of anthocyanins from other flavanoids. E.V.T.

Absorption Spectrum and Decay Kinetics of the Metastable State of Chlorophyll *b*

S. Claesson, L. Lindqvist, and B. Holmström

Nature, **183**, 661–662 (7 March 1959)

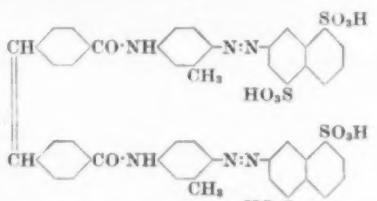
The absorption spectra of chlorophyll *b* in the ground state and in the metastable state have been determined by flash spectroscopy. The three kinetic constants for the decay of the metastable state of chlorophyll *b* in benzene (10^{-7}–10^{-5} molar) have been measured. E.V.T.

PATENTS

Disazo Direct Dyes, Anthraquinone Vat Dyes, Azoic Coupling Components, and Fluorescent Brighteners, from Stilbenedicarboxylic Acid Chloride

American Cyanamid Co. *USP* 2,877,218

Stilbene-4,4′-dicarboxylic acid is heated with thionyl chloride in pyridine to give the acid chloride, which is condensed with suitable primary amino-compounds to give the title products. Thus the aminoazo compound 2-naphthylamine-4,8-disulphonic acid→*m*-toluidine gives the greenish yellow direct dye—

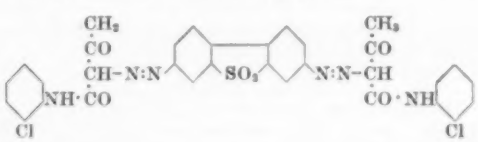


1-Aminoanthraquinone gives a yellow vat dye, naphthionic acid gives a fluorescent substantive product, and 1-amino-7-naphthol gives an azoic coupling component yielding e.g. with tetrazotised dianisidine a blue on cotton. E.S.

Disazo Pigments from 3,7-Diaminodibenzothiophenedioxide

Allied Chemical Corp. *USP* 2,879,266

3,7-Diaminodibenzothiophenedioxide (which may carry Alk groups as nuclear substituents) is tetrazotised and coupled with acylacetarylides or 1-aryl-5-pyrazolones free of solubilising groups to give yellow, orange, red, violet or brown pigments for colouring synthetic plastics and of good resistance to bleeding. Thus acetoacet-*o*-chloroanilide gives the greenish yellow pigment

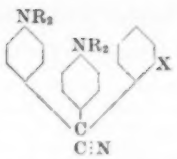


E.S.

4,4′-Bis-dialkylamino-2″-halogenotriphenylacetonitriles for Producing Photographs of Good Fastness

L. Chalkley *USP* 2,877,166

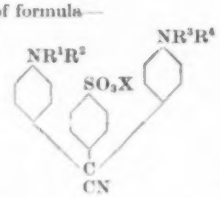
Compounds of formula—



(R = Alk; X = Hal) are colourless. In presence of an activator they yield strongly coloured compounds on exposure to ultraviolet radiation. These coloured compounds do not fade on storage in the dark. Thus 4,4′-bisdimethylamino-2″-chlorotriphenylacetonitrile prepared from Setoglaucine (C.I. Basic Blue I) is dissolved in a lower aliphatic alcohol which acts both as solvent and activator. Paper or cloth impregnated with this solution, dried and then irradiated with ultraviolet energy becomes an intense bluish green. C.O.C.

Hydrophilic Cyanides of *p*-Aminotriphenylmethane Dyes
L. Chalkley *USP* 2,877,167

Compounds of formula—



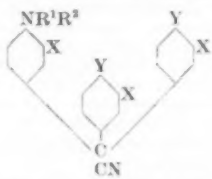
(R^1,R^2,R^3,R^4 = CH_3 or C_2H_5; X = cation) are activated by water alone to make them yield the parent dye when irradiated by ultraviolet energy. Used on photographic paper they yield prints that are fully formed without development, that may be permanent and may be examined in ordinary indoor illumination without fixing. The paper retains its ultraviolet sensitivity after the printing of one image so that other portions may be printed upon later. Examples given are the cyanides of Helvetia Green (C.I. 42020) and Brilliant Green (C.I. Basic Green 1).

USP 2,877,168

The cyanide of Acid Fuchsine (C.I. Acid Violet 19) is used.

USP 2,877,169

Hydroxyalkyl dye cyanides of formula—



(X = H or CH_2; R^1 = Alk having at least one hydroxy or halogeno substituent; R^2 = H or R^1; Y = H, NH_2 or NR^1R^2) unlike the cyanides of ordinary *p*-aminotriphenylmethane dyes are nonionic and hydrophilic not hydrophobic. They are soluble both in water and a wide range of organic photoactivators. Examples include hexa-(β-hydroxyethyl)-*p*-rosaniline cyanide and hexa-(chlorohydroxypropyl)-*p*-rosaniline cyanide. C.O.C.

Hair Dye from Hydroquinone and Dihydroxyphenylalanine and/or Dihydroxyphenylglycine
Apod Corpn. *USP* 2,875,769

Hydroquinone is treated in alkaline aqueous solution with a dihydroxyphenylalanine, e.g. 3,4-dihydroxyphenylalanine, and/or a dihydroxyphenylglycine, e.g. 3,4-dihydroxyphenylglycine, until the colour that develops ceases to become darker. The resultant solution when mixed with an oxidising agent, e.g. H_2O_2, is used as a hair dye. C.O.C.

Cadmium–Mercury Sulphide Pigments
L. J. Gagliano and J. E. Daly *USP* 2,878,134

Pigments which in tints are brighter, cleaner, and stronger than cadmium-selenide-sulphide pigments are produced by heating a mixture of cadmium sulphide and mercury sulphide to > 400°c. in a non-oxidising or reducing atmosphere until the desired colour is developed. The pigments vary in hue from orange through red to maroon. C.O.C.

Nacreous Graphite (C.I. Pigment Black 10)
Francis Earle Laboratories *USP* 2,875,076

Graphite ground so that it forms irregular opaque plates 1–50 μ. diameter, 8 mμ. average diameter and 0·1–1·0 μ. thick used as a pigment yields an excellent pure black nacre with very good lustre and high resistance to heat. C.O.C.

Magnesium–Zinc Pigments, and their Use in Paints for Protecting Steel and Aluminium- and Magnesium-base Alloys Against Corrosion
Dow Chemical Co. *USP* 2,877,126

Mg (30–15%) and Zn (70–85%) are fused together, preferably in presence of a flux, to form a brittle alloy. This alloy may contain the brittle intermetallic compounds MgZn and $MgZn_2$. The alloy is then powdered so that at least 98% of it passes through a No. 325 standard mesh screen (U.S. standard sieve series). The powdered alloy is then mixed with a Zn chromate (C.I. 77955) or alkaline earth chromate, e.g. C.I. 77223, and made into paint. This paint is very effective in protecting steel, aluminium-base and magnesium-base alloys against corrosion. C.O.C.

Nacreous Molybdenum and Tungsten Oxides
Francis Earle Laboratories *USP* 2,875,074

Excellent nacreous pigments are obtained by crystallising molybdenum trioxide and/or tungsten trioxide from a melt containing one or both of these compounds and a boron compound. They have high thermal stability MoO_3 having m.p. 795°c. and WO_3 1473°c. C.O.C.

Yellow Vanadium–Zirconium Ceramic Pigment
Harshaw Chemical Co. *USP* 2,875,086

Pigments whose colour is lower in wavelengths < 600 mμ. and higher in those > 600 mμ. than hitherto known zirconium–vanadium yellow pigments are obtained by incorporating > 5% of indium and/or yttrium oxide (on the wt. of zirconium and/or vanadium oxide) in the calcination mix. C.O.C.

Green Ceramic Pigments
Harshaw Chemical Co. *USP* 2,875,085

Pigments which colour ceramic glazes green after they have been fired are obtained by calcining mixtures of zirconium oxide, silica, vanadium oxide and tin oxide at 1200–1500°c. C.O.C.

Rendering Organophobic Particles Organophilic
DuP *USP* 2,876,133

Organophobic particles, e.g. pigments, are rendered organophilic and so more readily incorporated in inks, paints, fabric coating compositions, etc. by coating the particles with a free-radical generating, addition-polymerisation initiator, degassing the particles and treating them in that state with the vapour of an addition-polymerisable ethylenically unsaturated monomer so as to polymerise it on the particles. Thus powdered silica (C.I. Pigment White 27) was slurried with an anhydrous cyclohexane solution of αα′-azobis-(αγ-dimethylvaleronitrile), placed in a reactor and thoroughly freed of cyclohexane, air and other adsorbed vapours by constant pumping at mercury vapour diffusion pump pressure for several hours at room temperature. It was then treated with monomeric methyl methacrylate vapour at room temperature for three days. The product was a white, free flowing organophilic powder containing 53% by wt. of poly(methyl methacrylate). C.O.C.

Carbon Black Apparatus (I p. 497)
Rendering Water-insoluble Pigments Soluble in Water and the Use of the Solutions in Dyeing (VIII p. 505)
Acylacetarylide Coupling Components Stabilised Against Formaldehyde Deterioration (IX p. 505)

V— PAINTS; ENAMELS; INKS

PATENTS

Printing Ink
Deutsche Gold- und Silber-Scheideanstalt vormals Roessler *USP* 2,876,119

Addition to printing ink of 0·5–3·0% by weight of a metal oxide produced pyrogenically and containing no

particle larger than 50 mμ. in diameter, renders the ink firmly adherent to synthetic film, so that the ink will not wipe off or offset as the printed film leaves the press. C.O.C.

Inks for Marking Condensation Polymers
Minnesota Mining & Manufacturing Co. *USP* 2,875,105
An ink formed by mixing a pigment with a solution of a copolymer of trifluorochloroethylene in an oxygenated organic solvent can be used on polyester and polyamide films, etc. C.O.C.

Tinting Bases for Both Oil and Water Reducible Paints
Sherwin-Williams Co. *USP* 2,878,135
A mixture of a water-insoluble pigment, a volatile organic solvent at least some of which is miscible both with oleoresinous varnishes and water, e.g. hexylene glycol or 3-methoxy butanol, and a liquid surfactant at least part of which is nonionic is used. C.O.C.

Bright Highly Reflective Finish on Sheet Metal by Use of Varnishes Pigmented with Aluminium (C.I. Pigment Metal 1)
American Can Co. *USP* 2,878,141

Densifying Coatings on Metal Substrates by Use of Isostatic Hydraulic Pressure
Vitro Corpn. of America *USP* 2,878,140

Magnesium–Zinc Pigments, and their Use in Paints for Protecting Steel and Aluminium- and Magnesium-base Alloys Against Corrosion (IV p. 501)

VI— FIBRES; YARNS; FABRICS

Rheological Interpretation of the Mechanism of Crease Recovery of Fibres
H. Sobue and K. Murakami
Text. Research J., **29**, 251–260 (March 1959)
A theoretical study has been made of the visco-elastic behaviour of fibres and filaments, in an attempt to interpret the mechanism of creasing and recovery. The relationship between crease angle of fibre, temperature, and creasing time is discussed theoretically and experimentally. S.B.D.

Theoretical Analysis of Rate of Liquid Absorption by Capillary Absorbing Media
A. R. Winch *Text. Research J.*, **29**, 193–199 (March 1959)
The subject is treated mathematically to find an overall rate of flow equation. S.B.D.

Stiffness and Resiliency of Wet and Dry Fibres as a Function of Temperature
G. M. Bryant and A. T. Walker
Text. Research J., **29**, 211–219 (March 1959)

Effect of Gamma Radiation on Cotton
III— Base Exchange Properties of Irradiated Cottons
R. J. Demint and J. C. Arthur
Text. Research J., **29**, 276–278 (March 1959)
It is demonstrated that cottons subjected to gamma radiation have base exchange properties by using radioactive cations. The number of groups on the cottons showing these properties increases with increasing radiation dosage. Salt bonds are probably the major linkages involved, since any cation can be replaced with another cation by varying the relative concentrations. S.B.D.

Physical Properties of Mercerised and Decrystallised Cottons
I— Effects of Swelling Agents on Fibres and Yarns
R. S. Orr, A. W. Burgis, F. R. Andrews, and J. N. Grant
Text. Research J., **29**, 349–355 (April 1959)
Yarns from three varieties of cotton were scoured, extracted with chloroform, mercerised, and decrystallised in anhydrous ethylamine without tension. Breaking loads for yarns immersed in soln. when compared to those in water were virtually unchanged by ethylamine but were appreciably decreased by NaOH. Yarn shrinkages of 35% for NaOH and 17% for ethylamine were related to their increases in cross-sectional areas and cell sizes. Strength increases during mercerisation are attributed to increased uniformity of strength along the fibre length.

II— Effects of Strains During Swelling, Washing and Drying
R. S. Orr, A. W. Burgis, J. J. Creely, T. Mares, and J. N. Grant *Ibid.*, 355–363
Yarns from two varieties of cotton were mercerised and decrystallised when strain was controlled to provide unrestricted shrinkage in length, normal length, and 3% extension beyond normal length during ethylamine treatment. Strains had no influence on the crystallinity ratio during decrystallisation but prevented complete conversion to cellulose II in mercerisation. The densities of the mercerised samples were in general below those of the decrystallised ones if occluded solvents were removed. Yarn tenacities of decrystallised samples were virtually equal at standard and wet conditions while those of the mercerised samples increased with the moisture regain. Elongation at break was decreased by strain during treatment and increased with the moisture in the sample when tested. S.B.D.

Relation between Crystallite Orientation and Tensile Properties of Mercerised Cotton
T. Radhakrishnan, B. V. Iyer, G. S. Viswanathan, and H. Wakeham *Text. Research J.*, **29**, 322–331 (April 1959)
The fine structures of several varieties of raw cotton were changed in a controlled manner by means of mercerisation under varying degrees of stretch, and the crystallite orientation, tensile strength, and extensibility found. From these results it was concluded, among other things, that mercerisation increased the fibre orientation even under free shrinkage; that the fibre crystallinity tended to recover slightly at high mercerisation stretches; and that although the effect of crystallite orientation on extensibility is strong, it is specific for each type of cotton. S.B.D.

Mechanical Behaviour of Cyanoethylated Cotton Textiles
C. M. Conrad *Text. Research J.*, **29**, 287–302 (April 1959)
Previously published and other data on the mechanical properties of cyanoethylated cottons have been collected together, expressed in consistent units, and interpreted in terms of the degree of cyanoethylation of the materials. S.B.D.

Phosphonomethylation of Cotton
G. L. Drake, W. A. Reeves, and J. D. Guthrie
Text. Research J., **29**, 270–275 (March 1959)
A new phosphorus-containing ether of cellulose has been prepared by the reaction of cotton with chloromethylphosphonic acid in the presence of caustic soda. Phosphorus contents from 0·2% to 4·0% were obtained. By control of the phosphonomethylation reaction, derivatives can be made which range from water-soluble to fibrous materials in which the physical properties of the untreated cotton are virtually unaltered. Phosphonomethyl cotton is flame resistant in the ammonium salt form and has a cation-exchange capacity equivalent to some of the cation-exchange resins. S.B.D.

Effect of Caustic Soda on BX Rayon Yarn
K. Kato and K. Yamada
Text. Research J., **29**, 368–370 (April 1959)
BX yarn, which has a highly developed microfibrillar structure, was soaked in aqueous NaOH of varying concn. at 25°c. for 90 min., then subjected to hydrolysis in 2·5 N-HCl for 30 min. at 105°c. The hydrolysis residues were collected and examined under the electron microscope. It is suggested that the increase in size of hydrolysis crystallites with increase of alkali concn. was a reflection of the growth of the levelling-off D.P. and could be interpreted as the longitudinal joining of adjacent crystallites. S.B.D.

Occurrence of 4-*O*-Methyl-D-glucuronic Acid in Jute Hemicellulose
G. G. S. Dutton and I. H. Rogers
Text. Research J., **29**, 285 (March 1959)
It is demonstrated that a previous reference to the occurrence of 3-*O*-methyl-D-glucuronic acid in jute hemicellulose is incorrect and that the material actually is 4-*O*-methyl-D-glucuronic acid. S.B.D.

Degradation of Jute Cellulose on Storage
H. Chatterjee and A. K. Mazumdar
Text. Research J., **29**, 282–283 (March 1959)
It is established that pure alpha-cellulose undergoes quite a significant drop in D.P. on storage, accompanied by

an increase in its reducing power and acidity. Storage of jute fibre does not affect the D.P. of the contained alpha-cellulose, probably due to the protective effect of the associated non-cellulosic materials. It is concluded that the deterioration is due to the combined effect of oxidation and hydrolysis of the cellulose chain. S.B.D.

Two-phase Structure in Keratin
M. Feughelman
Text. Research J., **29**, 223–228 (March 1959)

A two-phase structure is proposed for keratin fibres consisting of a water-absorbing matrix (M), in which non-water-absorbing cylinders are embedded parallel to the fibre axis. The main assumption made is that only the mechanical moduli of M are affected by moisture uptake as long as the fibre is not stretched. On this basis, using the longitudinal and radial swelling data available, quantitative relationships between the dry and wet Young's moduli and rigidity moduli were obtained which agreed with experimental results. Further, other physical observations were shown to be compatible with this model. S.B.D.

Second-order Transition Temperature in Wool Fibres in the Post-yield Region
M. Feughelman, A. R. Haly, and B. J. Rigby
Text. Research J., **29**, 311–313 (April 1959)

For stretched wool fibres in water the transitional temperature is 60–70°c. Below this temperature a fibre under constant rate of loading passes from the yield to post-yield regions at a value of about 30% extension which is independent of temperature. Above the transition temperature the value of the extension where the turnover takes place increases with increasing temperature. The foregoing is not affected by physical or chemical modifications to the fibres. S.B.D.

Exchange of Hydrogen and Deuterium in Stretched Keratin
E. G. Bendit, M. Feughelman, R. D. B. Fraser, and T. P. MacRae *Text. Research J.*, **29**, 284–285 (March 1959)

The reaction can be studied by means of infrared spectra in the range 4000–6000 cm^{-1}. Allowing fibres to reach equilibrium in D_2O without stretching gives spectra indicating that the orientated areas of the fibres are not penetrated. Subsequent stretching to 40% gives spectra showing that all the peptide linkages are able to react, and, therefore, that the D_2O can penetrate all the fibre. S.B.D.

Thermal Behaviour of Cortical Fractions of Wool
M. Leveau
Bull. Inst. Text. France, (80), 57–63 (April 1959)

The thermogravimetric behaviour of ortho- and para-cortical cell fractions is reported. The wt./temp. curve of the ortho-cortical fraction exhibits two points of inflection in the range 200–300°c. corresponding to isothermal weight-losses. This behaviour is not shown by the para-cortical fraction, by intact wool, nor by wool subjected to the hydrolytic procedure which precedes the isolation of the two cortical fractions. The inflections are not present if the ortho-cortical fraction is heated in N_2, and are thus presumed to be associated with oxidative reactions. The failure of intact wool to show the effect is attributed to the impermeability of the cuticle. J.C.F.

Urea-Bisulphite Solubility of Wool— Influence of Heat
G. Gianola, O. Meyer, and R. Grillot
Bull. Inst. Text. France, (79), 47–60 (Feb. 1959)

The solubility of wool in urea–bisulphite is reduced by preliminary drying. The solubility decreases with increasing time (1–24 hr.) and increasing temp. (60–120°c.) of drying, but is independent of the initial moisture content. Drying does not affect the solubility of wool in phenol–thioglycollic acid or in NH_3-peracetic acid. There is no alteration in cystine content, or in the reactivity of cystine towards bisulphite. It is suggested that the effect is due to the formation of strong inter-chain hydrogen bonds. The sensitivity of the urea–bisulphite solubility test to changes in molecular structure is pointed out. J.C.F.

Cortical Fractions of Merino Wool— Solubility Characteristics
M. Leveau
Bull. Inst. Text. France, (79), 61–69 (Feb. 1959)

Material from the ortho-cortex of wool is more readily dissolved by 4 N HCl (65°c.), 0·1 N Na_2CO_3 (65°c.), cupriethylenediamine (17°c.), and formamide (100°c.) than para-cortical material. By contrast, bromine water (17°c.) dissolves the para-cortical fraction preferentially. The two fractions have approximately equal solubilities in urea–bisulphite, but preliminary drying at 105°c. for 4 hr. markedly reduces the solubility of the ortho-cortical fraction, whilst leaving that of the para-cortical fraction almost unchanged. (See preceding abstract.) J.C.F.

Solubility of Wool in Urea-Bisulphite— Effect of Iodination
M. Leveau *Bull. Inst. Text. France*, (80), 65–70 (April 1959)

When wool is iodinated with solutions of iodine in ethanol, its solubility in urea–bisulphite falls linearly as the amount of combined iodine increases. It is suggested that the iodine atoms in the *ortho* positions prevent the approach of urea molecules to the hydrogen-bonded tyrosine –OH groups. Examination of the behaviour of separated ortho- and para-cortical fractions shows that the insolubilising effect of iodination is almost entirely confined to the ortho-cortical fraction. J.C.F.

Supercontraction of Wool Fibres by Aromatic Compounds
W. G. Crewther J.S.D.C., **75**, 189–194 (April 1959)

Cysteic Acid in Wool Hydrolysates— Separation and Estimation by Electrophoresis
M. Bauters, L. Lefebvre, and M. Van Overbèke
Bull. Inst. Text. France, (80), 7–15 (April 1959)

Cysteic acid is separated from other amino acids by electrophoresis on paper in ammonium carbonate buffer (pH 9). The dried paper is sprayed with 0·2% ninhydrin in *n*-butanol, and after development the spot is excised and eluted with 0·1% $CdCl_2$ in methanol–water (60:40), and the colour measured. The following values (% cysteic acid) are quoted— whole wool, 0·27; wool tips, 0·55; de-tipped wool, 0·24; exposed to ultraviolet light, 0·34; peroxide bleached, 1·27; exposed to ultraviolet light and then peroxide bleached, 2·38. J.C.F.

Reaction of Wool with Sodium Hydroxide in Concentrated Salt Solutions
J. R. McPhee *Text. Research J.*, **29**, 303–310 (April 1959)

The properties of wool after treatment with NaOH in a series of 2M. salt soln. show that anions protect from alkaline degradation in the order $S_2O_3^{2-}$, SO_3^{2-}, citrate $> CO_3^{2-} > SO_4^{2-} >$ acetate $> Cl^- > Br^- > I^- > CNS^-$, while cations protect in the order Li^+, $Na^+ > K^+$. The swelling of wool is decreased by some 2*M* salt soln. but is unaffected by others. The rate of sorption of OH^- by wool is the same from all the soln. and equal to that from pure NaOH soln. Water is sorbed preferentially from some salt soln. but no specific anion sorption occurs, salt effects on wool are therefore unlikely to be due to dehydration of the wool or to ion binding. Results of practical interest are that wool can be shrinkproofed without damage by treatment with certain NaOH and salt soln. and that yellowing of wool in alkali can be prevented by the addition of reducing agents, such as sodium bisulphite, to the soln. S.B.D.

Acrylonitrile in the Textile Industry
J. H. MacGregor J.S.D.C., **75**, 181–189 (April 1959)

PATENTS

Pigment Mixture for Incorporation in Ripened Viscose
Industrial Rayon Corpn. *USP* 2,875,077

Pigment dispersed in a stable viscous liquid miscible and compatible with viscose, e.g. corn syrup, can be kept for prolonged periods without any settling out. Such a dispersion may readily be precisely and continuously introduced into ripened viscose under pressure, before the viscose is extruded, to produce coloured yarns or foils. C.O.C.

Coating Fibres with Metal by Decomposable Gas Plating
Industrial Rayon Corpn. *USP* 2,877,138

The filament is treated with an electrically conducting material and is then treated with an electric current to heat it. The heated filament is then treated with a vaporised compound which at the temperature employed decomposes to form a coating on the filament. Thus aluminium powder (C.I. Pigment Metal 1) is dispersed in

polycaprolactam which is then formed into a filament. An electric current is passed through the filament so as to maintain the filament at 275°F. The filament is then passed through an atmosphere of nickel carbonyl and CO_2 at 150°F. This results in the filament being given a bright, lustrous and tenacious coating of nickel without any degradation of the polymer. In other examples, filaments made from viscose in which stainless steel (C.I. 77485) has been dispersed and paper containing aluminium powder, are similarly treated. C.O.C.

Flame Resisting Cellulose Acetate or the like
DuP *USP* 2,876,117

Addition of metal pyrophosphates, particularly iron or titanium pyrophosphate, into cellulose acetate compositions renders fibres, foils, etc. produced from such compositions resistant to burning without any loss in tensile strength, resiliency or handle or lowering of softening or melting point.

USP 2,876,118

Ferric pyrophosphate-hydrous metal oxide flame-retarding compositions are used. C.O.C.

Stabilised Acrylonitrile Polymers
Chemstrand Corpn. *USP* 2,878,200
USP 2,878,202—2,878,231

Claims a very wide range of compounds, both inorganic and organic, for stabilising acrylonitrile polymers against developing colour on standing or exposure to heat. C.O.C.

VII—DESIZING; SCOURING; CARBONISING; BLEACHING

Bleaching with Peroxide. I—Chemical Stability of Dilute Solutions
N. Hartler, E. Lindahl, and C.-G. Moberg
Svensk Papperstidning, **62**, 269–276 (30 April 1959)

Test solns. were kept in a thermostat at 60°C. and aliquot samples taken at regular intervals. After addition of a few drops of sat. ammonium molybdate, the H_2O_2-content was titrated with N/10 thiosulphate and decomp. curves drawn. Even the material of the container affects decomp. Decomp. of a 1·3 g./l. peroxide soln. kept for 3 hr. at high pH in polyethylene bottles reached a max. of 35% while in glass bottles, not washed with dichromate it reached a max. of 80% at pH 11. Stability is decreased by Cu and Mn, not affected by Ca, Al, Fe^{+++} and Pb, and increased by Mg sulphate and by silicate containing free silicic acid. EDTA counteracts the effect of Mn, but the amount required does not make it an economical proposition. R.A.

Rôle of Oxygen in the Radiolytic Bleaching of Aqueous Solutions of Indigo Carmine (C.I. Acid Blue 74)
A. A. Zansokhova, V. D. Orekhov, and M. A. Proskurnin
Doklady Akad. Nauk S.S.S.R., **125**, 577–579 (21 March 1959)

Aq. soln. of Indigo Carmine (I) are irradiated with γ-rays of varying intensity at pH 0 and 6 in the absence and presence of gaseous oxygen (1 and 80 atm.) and the yields of oxidation of I are determined. It is shown that O_2 plays the part of a sensitiser in dye oxidation, max. oxidation occurring in 2N-H_2SO_4 and being independent of O_2 pressure. The chain mechanism for the process of radiation-chemical oxidation is opposed, and the following mechanism suggested—

$$H_2O \rightarrow H + OH;\ H + O_2 \rightarrow HO_2;\ 2HO_2 \rightarrow H_2O_2;$$

$$(I) + OH + H_2O_2 \rightarrow \text{oxidation products.}$$

Purification of the reagents is essential. G.J.K.

PATENTS

Preventing Corrosion in Chlorite Bleaching
H. P. Gelderman & Zonen *BP* 817,339

The material is impregnated with aqueous sodium chlorite and then treated in a closed space whose atmosphere maintained at 140–212°F. consists of steam and a volatile reducing agent, e.g. H_2S or HCHO. When HCHO is used the formic acid formed is used to activate the sodium chlorite. C.O.C.

Bleaching Speciality Hair Fibres with Hydrogen Peroxide
Food Machinery and Chemical Corpn. *USP* 2,875,018

Mohair, cashmere, alpaca, vicuna or the like are first scoured and then treated with a solution of an iron salt containing as reducing agent an oxy acid of S in which the S has valency < 6. The fibres are washed and treated with an acid solution of H_2O_2. After being again washed, they are bleached with an alkaline bath of H_2O_2 in the manner normally used for wool. Thus dark brown cashmere was treated for 10 hr. in an aqueous bath containing, on the wt. of the fibre, 3% ferrous ammonium sulphate and 2% sodium hydrosulphite at 100°F. It was then rinsed in water and excess water removed. The cashmere was then treated for 2 hr. at 110°F. in an aqueous solution containing 2% H_2O_2 and $2H_2SO_4$. It was then rinsed with water and neutralised with 0·4% aq. $NaHCO_3$ and again rinsed. Finally it was bleached for 4 hr. at 110°F. in a bath containing per litre 3 g. Na metasilicate, 2 g. $NaHCO_3$ and 40 ml. H_2O_2 35%. This yielded a very light yellowish product of uniform appearance even the dark hairs present being bleached down to the general level. The lustre and softness of handle were fully retained. C.O.C.

Bleaching and Sizing Paper Pulp
Albermarle Paper Manufacturing Co. *USP* 2,878,119

Sulphate pulp is mixed with a hypochlorite bleach and then after an effective bleach has been obtained alum added both to release the chlorine remaining in the residual hypochlorite and to set the rosin size. The size is added either at any time before the alum is added or afterwards. There is no need for separate washing of the bleached pulp. C.O.C.

Simultaneously Bleaching and Coating Paper (XI p. 508)

VIII—DYEING

Cellulose Substantivity
W. L. Lead J.S.D.C., **75**, 195–196 (April 1959)

Fluorescent Brightening Agents in Surgical Dressings
K. R. Capper; D. A. W. Adams
J.S.D.C., **75**, 195 (April 1959)

Electro-Dyeing of Fabrics
V. E. Rostovtsev and R. M. Trakhtenberg
Tekstil. prom., **19**, 55–58 (April 1959)

Open-width fabric, as an endless loop, is impregnated with dye solution and passed between charged rollers; diagrams of fabric passage and electric circuits are shown. Graphs are given relating current power to fabric width and speed of passage respectively. Laboratory experiments indicate increased intensity of dyed fabric and considerably shorter dyeing times compared with identical dyeing conditions without the current. The relationship between the diameters of the charged rollers and their distance apart is expressed by a mathematical formula. Fastness data for canvas and wool fabrics dyed with acid dyes and for grey cotton dyed with a direct dye at 92–98°C. with and without the current are given. G.J.K.

Effect of High-temperature Water and Steam on the Physicochemical and Dyeing Properties of Viscose Rayon
E. Rexroth *Textil Praxis*, **14**, 284–289 (March), 388–396 (April 1959)

High-temperature steaming of viscose rayon reduces the swelling of the fibre. The magnitude of this effect depends on the temperature and dryness of the steam, and the moisture content and past history of the yarn. After steaming for 1 hr. at 133°C. certain physical properties (breaking load and extension) are modified but the degree of polymerisation remains unaltered. With increasing temperature and duration of treatment the crystal lattice undergoes transition from cellulose II to cellulose IV. The initial rate of dyeing of high temperature steamed viscose rayon (with vat dyes) is lower than that of the untreated yarn. In liquor circulating machines the penetration of the package by the dye liquor is greater (as a result of lower swelling of the filaments) and the dyeing more uniform throughout the package. Physical and fine structure changes in viscose rayon treated in water at 140–160°C. are in general similar to those brought about by high temperature steam. L.A.T.

High-temperature Dyeing of Piece Goods

F. Fourné *Textil Praxis*, **14**, 289–294 (March 1959)

After discussing the interrelation between the temperature, shrinkage, and diffusion of dyes into synthetic fibres the author reviews recent developments in the field of equipment for high temperature dyeing with particular reference to pressurised jigs, star frames and beam dyeing. L.A.T.

Interaction between Dyes and Surfactants—I

T. Kondo and K. Meguro

Bull. Chem. Soc. Japan, **32**, 267–271 (March 1959)

A study of the interaction between Rhodamine 6G (C.I. Basic Red 1) and anionic surfactants (sodium decyl, dodecyl, and tetradecyl sulphates) and between Eosine (C.I. Acid Red 87) and cationic surfactants (dodecylpyridinium chloride, bromide, and iodide). Addition of surfactant to dye soln. causes in each case precipitation of dye–surfactant complex (flocculation) followed, at higher surfactant concn., by resolubilisation of the complex (deflocculation). For anionic surfactants (with cationic dye) the width of the flocculation zone (i.e. concn. range of surfactant over which flocculation occurs) decreases with increasing length of alkyl chain. With cationic agents (and anionic dye) the width of the zone increases with increasing degree of hydration of the agent anion (i.e. $Cl > Br > I$). In both cases the width of the flocculation zone increases linearly with dye concn. and a "deflocculation number" (min. No. of surfactant ions to cause deflocculation) can be calculated. This varies with the No. of C atoms in anionic agents, and with the lyotropic No. of the gegenions in cationic agents, in the same way as does C.M.C. of the agents. It is suggested that deflocculation occurs by micelle formation between the dye–surfactant complex and surfactant ions. A.J.

Vat Dyeing of Cotton and Viscose Packages

K. J. Bardt *Amer. Dyestuff Rep.*, **48**, 43–48 (23 March 1959)

The importance of controlling liquor flow and rate of strike when dyeing cotton and rayon packages is discussed with special reference to vat dyes. The influence of package shape on liquor flow is stressed. The following approaches to the control of the rate of strike and promotion of level dyeing are considered: (*a*) levelling agents, (*b*) temperature control, (*c*) application of the dye in an easily controlled unreduced form, (*d*) application of modified leuco forms. A selection of commonly used vat dyes is summarised briefly. W.P.M.

Dyeing Cellulosic Staple continuously with Procion Dyes

J. A. Fowler *Silk and Rayon*, **33**, 249–253 (March 1959)

Viscose staple fibre, in the form of a lap, can be satisfactorily dyed with Procion dyes using a Fleissner drum washing machine or a Callaghan impregnating range. A.J.

Even Dyeing of Textiles made from Irregular Continuous-filament Polyamide Fibres

H. Egli *S.V.F. Fachorgan*, **14**, 179–185 (April 1959)

A brief account is given of various attempts to overcome barriness in polyamide textiles when dyeing with anionic dyes. The application of Lyogen P (8) for this purpose is described in greater detail. Depending on the type of dye one of three variants of the process can be used: (1) Lyogen P in the dyebath together with $(NH_4)_2SO_4$ for light shades and CH_3COOH for darker shades, (2) pretreatment with Lyogen P and CH_3COOH or HCOOH, (3) pretreatment with Lyogen P and $(NH_4)_2SO_4$. In conclusion the author emphasises that any auxiliary or levelling agent is successful only with selected dyes and should not be used indiscriminately. L.A.T.

Dyeing of Cellulose Acetate Blends and Arnel Triacetate Blends

V. S. Salvin

Amer. Dyestuff Rep., **48**, 49–55 (6 April 1959)

The dyeing of blends of acetate rayon and Arnel triacetate with cotton, viscose rayon, nylon, Dacron and Orlon is discussed. Preparation of material, dyeing method, dye selection, influence of dyebath assistants on dyestuff distribution, reserve effects and fastness are considered. W.P.M.

Dyeing and Finishing of Acrylics

H. Vetter *Textil Praxis*, **14**, 409–412 (April 1959); 513–517 (May 1959)

A general survey of the field of dyeing of acrylic fibres, particularly Dralon HB and Dralon N (FBy), with disperse (Resolin and Celliton) and basic (Astrazon) dyes. The former dissolve in the fibre, whilst the latter become attached by adsorption, solution, and chemical combination— approximately in the ratio 1 : 3 : 7. L.A.T.

Dyeing of Zefran (Dow) Polyacrylonitrile Fibre with Naphthanilid (Rohner) Dyes

H. Herzog and J. Koszticza

S.V.F. Fachorgan, **14**, 195–204 (April 1959)

Unlike other known polyacrylonitrile fibres Zefran can easily be dyed with Naphthanilid (azoic coupling component) dyes. Impregnation takes place at 75°C. Differing substantivity of various Naphthanilid coupling components on cellulosic fibres bears no relationship to their behaviour towards Zefran. The development with the azoic diazo components takes place with ease at room temperature. The coupling is completed by padding with intermediate drying before coupling. On account of risk of yellowing of the fibre (at least in its present form) the dyeings should not be washed at 95°C. L.A.T.

PATENTS

Rendering Water-insoluble Pigments Soluble in Water and the Use of the Solutions in Dyeing

General Aniline *USP* 2,876,061

Water-insoluble pigment containing a reducible and salt-forming group is rendered water-soluble by treating it at 200–300°F. with $\leq$ an equimolecular amount of caustic alkali and 5–100 parts by weight of a water-soluble polyhydric alcohol solvent for the pigment. The resulting dye concentrate readily dissolves in cold water in any proportions. Thus Algol Pink R (C.I. 76045) (1 g.) and diethylene glycol (20 c.c.) were pasted and heated to 220–250°F. To the red solution there was added anhydrous KOH (0·25 g.) and heating and mixing continued. The solution became bluish violet. The volume was then brought to 1 litre with cold water to yield a clear reddish solution. Dyebaths were made by mixing this solution (100 c.c.) with tap water (100 c.c.). Dacron, Saran, wool and silk (10 g. samples) were dyed in these baths to an even pink of very good fastness properties. Excellent blue dyeings on acetate, Dacron, nylon and wool were similarly obtained by use of Alizarine Sky Blue B Base (C.I. Solvent Blue 12). C.O.C.

Leather Dyeing

General Aniline *USP* 2,872,277

Level dyeings of improved fastness to washing, light, etc. are obtained by spraying leather with an aqueous solution of a sulphuric acid ester salt of a leuco vat dye and then treating it with an acid solution. Thus excellent yellow dyeings are obtained by spraying with Algosol Golden Yellow IGK (C.I. Solubilised Vat Yellow 4) with $NaNO_2$ in the solution, partly drying, brushing with 2% HCl and finally spraying with 2% ammonia. C.O.C.

IX— PRINTING

PATENTS

Photogravure Printing on Cloth

Apponaug Co. *USP* 2,878,096

Cloth having a smooth surface is led through tension devices and laid on the rubber-covered surface of an iron cylinder. The cloth is then printed by being passed through the nips formed by photogravure engraved cylinders rotating against the iron cylinder. This enables the fine detail and continuous tone gradations hitherto obtainable on cloth only by the transfer print technique to be produced by direct printing. C.O.C.

Acylacetarylide Coupling Components Stabilised Against Formaldehyde Deterioration

General Aniline *USP* 2,877,083

Acylacetarylides free from water-solubilising sulphonic and carboxylic acid groups and forming part of an azoic composition acquire increased resistance to attack by formaldehyde if an *o*- or *p*-phenylphenol or an alkali metal salt thereof is also present in the composition. Thus the diazoamine from dianisidine (85 g.), diazotised and stabilised with methyl taurine, C.I. Azoic Coupling Component 2

(50), C.I. Coupling Component 5 (22), Na *o*-phenylphenate (25), 70% aq. dimethylethanolamine (30), diethyleneglycol (50), Cellosolve (50), 40°Bé. NaOH (120) and water (525) when printed and aged in acid steam yield a good jet black. Prints made from a similar paste containing no Na *o*-phenylphenate were a much bluer black, a much less bluer black being obtained by a paste containing the stabiliser and in addition formaldehyde. C.O.C.

Diazotype Process
A. Tanenbaum and R. P. Royer *BP* 816,601

Prints are produced by hot pressing an exposed diazotype sheet against a sheet containing a salt of an amine salt of a weak acid. C.O.C.

Bis-triazinylaminostilbenes as Supersensitisers for Photographic Emulsions sensitised by Cyanine Dyes
Eastman Kodak Co. *USP* 2,875,058

1,3-Diamino-2-propanol Tetraacetic Acid as Stabiliser for Developers used in Colour Photography
Eastman Kodak Co. *USP* 2,875,049

Development of Electrostatic Images
Haloid Xerox *USP* 2,877,132

Development of Electrostatic Images
General Dynamics Corpn. *USP* 2,877,133

4,4′ - Bis - dialkylamino - 2″ - halogenotriphenylacetonitriles for Producing Photographs of Good Fastness (IV p. 500)
Hydrophilic Cyanides of *p*-Aminotriphenylmethane Dyes (IV p. 501)
Decorated Plastic Sheeting (XIII p. 509)
Sensitometry of Colour-photographic Materials and Processes (XIV p. 512)

X—SIZING AND FINISHING

Mechanisms of Fibre and Yarn Lubrication
C. Schlatter, R. A. Olney, and B. N. Baer
Text. Research J., **29**, 200–210 (March 1959)

Copper–Cellulose Complexes
D. S. Belford, C. D. Cook, E. H. Nevard, and R. D. Preston
Nature, **183**, 988 (4 April 1959)

In the N.G.C. process for preserving cellulose, the material is treated with a solution of copper formate and then heated. It is believed that copper–cellulose complexes which are stable to hydrolysis are formed. The recent discovery of a copper–cellulose complex which is formed in the cold, and is rapidly hydrolysed by dilute acids, cannot be taken as support for the earlier hypothesis. E.V.T.

Density Changes in Cellulose treated with Urea–Formaldehyde Resins
R. Steele and R. P. Schiwall
Text. Research J., **29**, 228–234 (March 1959)

Density changes produced in cotton and rayon fabrics by treatment with four thermosetting resin precondensates have been determined in density gradient columns. With the assumption that the density of resin cured alone corresponds to its density in the fibre, the results indicate that the predominant effect is fibre swelling, with very little resin being deposited in void spaces not previously accessible to the solvent mixture in the density gradient column. Scouring the treated fabric to remove reaction residues lowers the density, indicating that the fibre structure does not collapse, presumably because it is stabilised by the reacted resin. The effect of resin concentration on moisture regain was also determined with these samples. The results are consistent with the changes in mechanical properties observed for cross-linking and non-cross-linking resins on cotton and rayon. S.B.D.

Chemical and Physical Effects of Finishing Cotton with Methylol Derivatives of Ethyleneurea
J. G. Frick, B. A. Kottes, and J. D. Reid
Text. Research J., **29**, 314–322 (April 1959)

It is demonstrated that the methylol derivatives of ethylene–urea react chemically with cellulose under the influence of acidic catalysts, particularly metallic salts. Both mono- and difunctional compounds react, although only the latter cause cross-linkage with its marked effects on the physical properties of the cotton. Dimethylol-ethyleneurea forms cross-links averaging about 1·5 ethyleneurea residues in length. These residues are connected by methylene groups. The effects of variations in catalyst, composition of finishing agent, and curing conditions are shown. The relation of the finding to practical finishing is discussed. S.B.D.

Silicone Water-repellents. IV—Waterproofing Treatment with Methyl Hydropolysiloxane Oil-in-water Emulsion
T. Araki and S. Hagiwara
Rep. Govt. Chem. Ind. Research Inst. Tokyo, **54**, 18–26 (iii) (Jan. 1959)

On treatment with methyl hydropolysiloxane oil-in-water emulsion of textiles and filter papers, effects of formulation, hardening catalyst, pH of the treating bath on the water repellency of the treated materials were studied. Among the catalysts used in curing methyl hydropolysiloxane the following naphthenate and octoates were found to give excellent results for acquiring rapid curing—Pb naphthenate, Pb octoate, and Zn octoate. Using urea–formaldehyde resin together with methyl hydropolysiloxane emulsion, the hydroproofing treatment of cotton cloths was carried out and the relations between the formulation of treating bath, catalysts used, treating condition, and the water-repellency of the cloths obtained were studied. C.J.W.H.

Mothproofing with Dieldrin
H. J. Hueck *Tex*, **17**, 1216–1223 (Sept. 1958)

Tests on undyed worsted fabrics treated with 0·01 to 0·1% DDT, γ BHC or Dieldrin applied from hydrocarbon solvents show that only Dieldrin at 0·1% is effective in proofing against clothes moth larvae after one washing (by hand for 30 min. at 40°c. in 0·5% soap) or one dry-cleaning (30 min. in trichloroethylene at 20°c.). The superiority of Dieldrin is due in part to its greater toxicity. Application of Dieldrin from aqueous emulsion to worsted fabric and carpet yarn gives a proof effective after five washings or, based on two experiments, five dry-cleanings. Fastness of 0·1% Dieldrin (applied from emulsion on to dyed fabric) to light, potting, cross-dyeing and perspiration is adequate to maintain an effective proof subject to the reservation that all the dyes used exerted some moth proofing effect (notably Neolan Blue 2G, Cibalan Blue BRL and Cibalan Red 2GL). With an acute toxicity (LD_{50}) to rats and dogs of 60 mg/Kg, Dieldrin is more toxic than DDT or γ BHC and it readily penetrates the skin. Estimates of the potential absorption from garments into the skin are inconclusive but the U.S. Dept. of Agriculture accept 0·05 $\pm$ 0·01% Dieldrin applied from emulsion on woollen fabrics as safe for use in garments and for garment storage, spraying with 0·5% Dieldrin in oil or water is permitted provided garments are dry-cleaned before use. (*In English.*) E.C.

Practical Application and Control of Dieldrin for Durable Mothproofing
J. P. Redston
Amer. Dyestuff Rep., **48**, 49–57 (23 March 1959)

The practical application of Dieldrin (85% hexachloroepoxy-octahydroendo, exo-dimethanonaphthalene, and 15% insecticidally active chlorinated hydrocarbons) to wool and its analytical control, are described. Dieldrin can be applied at almost every stage of dyeing or finishing. Higher application temperatures give improved durability but low temperature application gives adequate fastness. When applied before wet finishing allowance must be made for some loss during these operations. Analytical control is difficult but essential to ensure the Dieldrin content (0·05% $\pm$ 0·01%) necessary for permanent mothproofing. Even application often depends upon initial even mechanical application. Yield is affected by the emulsifying system, the liquor ratio, the pH and the time of application in that order. W.P.M.

"Efflorescence" Fault in Acetate Rayon Satin
P. Rochas, S. Pierret, and R. Bellaton
Bull. Inst. Text. France, (80), 79–86 (April 1959)

The phenomenon of blooming is shown to be due to the migration of inorganic or organic impurities to the surface of the fabric under the influence of water vapour during drying. Care in desizing, scouring, and rinsing, followed by drying on a tenter, prevents the appearance of the fault. Contact between the wet fabric and hot rollers should be avoided. J.C.F.

Cross-linking of Wool with Aldehydes. I—Cross-linking and Protection of Wool with Formaldehyde
G. Wibaux, G. Mazingue, and M. Van Overbèke
Bull. Inst. Text. France, (79), 25–45 (Feb. 1959)

Treatment of wool with solutions with pH values covering the range 2–10 in the presence and absence of formaldehyde (I) showed that I reduced loss in weight and loss of mechanical strength of the wool, where these occurred. Samples dyed with C.I. Acid Blues 50, 102, 158A possessed superior alkaline wet fastness when the dyeing was done in the presence of I. It is suggested that the protective action of I on wool is due to the formation of new cross-links, rather than to the stabilising of disulphide bonds. J.C.F.

PATENTS

Producing Resinous Copolymers *in situ* on fabrics
Joseph Bancroft & Sons Co. *USP* 2,876,136

A solution or dispersion containing a water-soluble precondensate of an aldehyde is used together with poly(vinyl alcohol). By this means the reaction between the two components does not take place until the fabric has been impregnated with the liquor. Thus dyed cotton cloth was impregnated with an aqueous solution containing methylated methylol melamine, poly(vinyl alcohol), Aerotex Softener H, NH_4 thiocyanate and ammonia. It was dried to 8% moisture content and twice friction calendered at 30 yd. per min. with steel rolls at 370°F. and a pressure of 25 tons. The friction ratio was 2·5 : 1. The fabric was finally cured for 150 sec. at 265°F., washed and dried. It had a very durable, highly glazed finish, excellent strength and very good handle. To obtain the same effect without using polyvinyl alcohol would require the fabric to have a much larger resin content. C.O.C.

Rendering Textiles Dimensionally Stable with Polyepoxides and Ammonia
U.S. Secretary of Agriculture *USP* 2,886,402

Wool or other textile is impregnated with a polyepoxide and then treated with gaseous ammonia. This yields excellent dimensional stability to repeated washing while not affecting the resiliency, porosity, strength or colour. In addition the treated textile has greatly improved crease-shedding properties. C.O.C.

Setting Nylon by Use of Anhydrous Hydrogen Halide Gas
Regents of the University of Minnesota *USP* 2,876,524

If nylon or other linear polyamide condensation polymer is treated with an anhydrous hydrogen halide gas it is set in the form in which it is treated. Thus nylon yarn wound on a glass rod was treated with anhydrous HCl at 90 cm. mercury pressure for 15 min. and then heated *in vacuo* overnight at 90°c. The yarn received a permanent curl. C.O.C.

Dimensional Stabilisation of Textiles containing Vinyl and/or Vinylidene Polymer Fibres
FBy *BP* 816,532

Treatment at open width in an aqueous bath at < 80°c. followed by immediate cooling of fabrics made from polymers of acrylonitrile and/or vinylidene cyanide or their copolymers with other vinyl compounds sets them for subsequent processing, e.g. dyeing, and use. Thus acrylic fibre cloth is passed at full width through an aqueous bath at 90–95°c. containing, per litre, 3–5 g. 85% formic acid and 0·1 g. of a stearylamine-alkylene oxide wetting agent. The cloth is in the liquor for 20 min. and on withdrawal is immediately cooled by spraying with water at 15–20°c. C.O.C.

Heat Setting of Oriented Fibres of Blended Polyvinyl Chloride Polymers and Cellulose Acetate
Dow Chemical Co. *USP* 2,877,084

Fibres made from a blended resin mixture of a vinyl chloride polymer and 5–50% by weight of cellulose acetate, are heated for 30–600 sec. at 125–150°c. in absence of tension until they have shrunk > 5%. They are then heated in a non-solvent medium having a slight swelling action, e.g. water, for 3–600 sec. at 90–105°c. until they have further shrunk by > 15%. The products may be used to make fabrics of better dimensional stability. The fibres have improved abrasion resistance and greater knot strength and better elongation than those obtained by conventional heat setting. In addition they lose less in tenacity and are not darkened. C.O.C.

Opaque Effects on Fabrics knitted from Synthetic Threads
Inhag Textwerke Max Foester *BP* 816,004

The fabric is passed between the nip formed by two rollers one of which is very finely engraved in an irregular pattern. C.O.C.

Rendering Fabrics resistant to the Passage of Toxic Gases
U.S. Secretary of the Army *USP* 2,875,167

Activated carbon is bonded to the fibres by use of (1) a polymeric carboxylic acid insoluble in water but soluble in aqueous ammonia, and (2) an emulsified water-insoluble polymer which forms the primary binder. The carboxylic polymer has several functions, it acts as a freeze-thaw stabiliser for the emulsified polymer, it disperses the carbon and improves its penetration into the fabric and, when enough is used, enables the coating to be removed by treatment with an alkaline detergent. C.O.C.

Soil-resistant Finish
Bibb Manufacturing Co. *USP* 2,876,140

The material is impregnated with $BaSO_4$ formed *in situ* in presence of a cationic softening agent and carboxymethyl cellulose. Thus a white rug having a cut viscose rayon pile was treated in 10% aq. $BaCl_2$ at 110°F. for 15 min., liquor ratio 30:1. It was extracted to 100% wet pickup and dried at 200°F. It was then treated in a 30:1 aqueous solution containing, on the wt. of the rug, 15% Na_2SO_4 2% Ahcovel R (Arnold, Hoffman & Co.), and 2% Na carboxymethylcellulose, at 110°F. for 5 min. 2% $MgSO_4$ (on wt. of rug) was then added and treatment continued for 5 min. and then 1% (on wt. of rug) of 56% acetic acid added and the rug treated for another 5 min., extracted and dried. C.O.C.

Opaque Aluminium Foil-like Coatings on Cloth, Paper, and other Fibrous Materials
Continental Can Co. *USP* 2,878,145

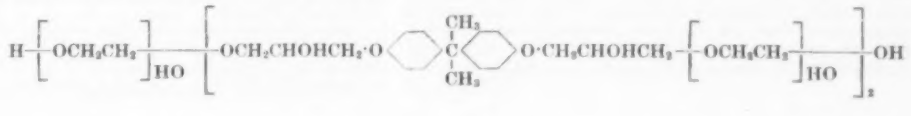
A thin coating of polyethylene containing a little aluminium powder (C.I. Pigment Metal 1) is extruded on to the cloth or the like. The aluminium is preferably a 400 mesh polished powder of average covering capacity in water 29,000 sq.cm./g. Addition of the aluminium to the polyethylene resin not only gives the desired metallic appearance but also enables only half the amount of polyethylene resin to be used that is normally required to produce a coherent coating. C.O.C.

Coating Fibrous Structures with Tetrafluoroethylene Polymer
DuP *USP* 2,876,131

Cloth, etc. is coated with an aqueous colloidal gel obtained by mixing an aqueous colloidal dispersion of tetrafluoroethylene polymer with 10–40% (on the wt. of dispersion) of an organic liquid of b.p. < 200°c. and which is miscible with water in all proportions. The coated cloth is then baked at > 100°c. until all the volatile constituents of the gel have been removed. C.O.C.

Chemically Bonding Coatings to Organic Polymers
DuP *USP* 2,875,092

Organic polymers may be given a durable coating of a non-polymerisable organic material if the coating has an extinction coefficient of $< 0{\cdot}5$ a wavelength 2000–4000 A. and then irradiating the coating with ultraviolet radiation in absence of oxygen. Thus nylon taffeta was padded with a 10% aqueous solution of a 'Bisphenol A" epichlorohydrin-coupled-polyethylene glycol of approximate formula—



so that when dried it has increased 21% in weight. It is then subjected to ultraviolet radiation for 1 hr. on the one side and then 1 hr. on the other side. It is then laundered. The treated fabric has an excellent anti-static finish which resists long wear and repeated launderings. C.O.C.

Compositions for Rendering Synthetic Films and Fibres Non-adherent, Heat-sealable at Low Temperatures, and Antistatic (III p. 498)

Coating Fibres with Metal by Decomposable Gas Plating (VI p. 503)

XI— PAPER AND OTHER CELLULOSIC PRODUCTS

Drying of Paper on Felt-covered Cylinders

O. Brauns and S. Ponton

Svensk Papperstidning, **62**, 245–250 (15 April 1959)

Experiments to establish the effect of the length of the wrap show that the felt should remain on the cylinder as long as possible. Three methods were employed to discover whether the water in the paper is removed in the liquid or the steam phase. The methods were based on (1) temp. measurements of the felt, (2) steam consumption in the felt dryers, (3) heat transfer to the cylinder. The results show that the relation steam:water in the case under investigation was 2:1, i.e. $\frac{2}{3}$ of the water was transferred to the felt in the vapour phase while the remaining $\frac{1}{3}$ was absorbed by the felt in the liquid phase. R.A.

Distribution of Degree of Polymerisation in Cellulose Rayons. VIII— Influence of D.P. and Molecular Orientation on the Mechanical Properties of Molecularly Homogeneous Monofilaments

R. J. E. Cumberbirch and W. G. Harland

J. Textile Inst., **50**, T 311–T 334 (April 1959)

Secondary cellulose acetate was fractionated into samples with known D.P. and wet-spun. Filaments from each sample were stretched to different extents under boiling water and the birefringence of the filament was taken as a measure of the orientation introduced into the filament. Tenacities and breaking extensions were measured with a Cambridge extensometer. The results show that D.P. is more important than previous work suggested in influencing the properties of rayon filaments. The authors point out that their results may not be strictly applicable to commercial samples of acetate rayon which have a wide distribution of molecular weights, and plan further work on such samples. P.T.S.

Hydrolysis of Cellulose in Phosphoric Acid Solution. Inductive Effects

R. H. Marchessault and B. G. Rånby

Svensk Papperstidning, **62**, 230–240, (15 April 1959)

Experiments on the rates of homogeneous hydrolysis of cotton and wood cellulose confirmed the differences found by earlier workers and suggested differences in molecular structure, leading to the conclusion that wood cellulose contains modified groups. Wood cellulose was then further modified by oxidation and reduction and the rate of hydrolysis in phosphoric acid measured before and after these modifications, the results being compared with related model compounds. The different behaviour of the two types of celluloses may partly be interpreted as an inductive effect due to electrophilic groups on the cellulose chains which are present in larger quantities in wood than in cotton cellulose and, therefore, may be expected to induce more rapid hydrolysis of adjacent acetal bonds in the wood cellulose chains (37 references). (*In English.*) R.A.

Etherification of Hydroxyethylcellulose of Low Degree of Substitution

N. T. Klenkova and O. M. Kulakova

Zhur. priklad. khim., **32**, 680–686 (March 1959)

A treatment of mercerised alkali cellulose with ethylene oxide at a room temp. results in the formation of a low-substituted hydroxyethylcellulose. This substance is much more reactive to alkyl halides than ordinary cellulose. Its alkyl derivatives are of high mechanical qualities, low hygroscopicity and are more stable to acids. T.Z.W.

New Carboxyl Derivatives of Cellulose

N. Ya. Lenshina, V. S. Ivanova, and V. I. Ivanov

Izvestiya Akad. Nauk S.S.S.R., otdel. khim. nauk, 559 (March 1959)

Oxidation products of cellulose containing up to 50·8% carboxyl (on the wt. of oxycellulose) retain the fibrous structure and show a high exchange capacity (11·4 mg.eq. per g.) G.J.K.

Basic Principles of Polysaccharide Hydrolysis

A. A. Konkin and Z. A. Rogovin

Zhur. priklad. khim., **32**, 852–857 (April 1959)

The resistance to hydrolysis of the acetyl bonds in the polysaccharides and monosaccharides differs very little. It does not depend upon the D.P. of the polysaccharide. The speed of hydrolysis of the polysaccharide in the heterogeneous medium is determined by their physical structure, which in turn depends upon the characteristic of the build up and the composition of their macromolecules. T.Z.W.

Helical Structure in Starch

A. N. J. Heyn

Text. Research J., **29**, 366–368 (April 1959)

The observation of helical structures in soluble starch is reported and illustrated with electron micrographs. From the observations it is suggested that in the starch grain the macromolecules of starch form long coiled polymer crystals or aggregates extending in the radial direction of the grain. S.B.D.

PATENTS

Simultaneously Bleaching and Coating Paper

Food Machinery & Chemical Corpn. *USP* 2,875,102

A reducing agent which bleaches paper stock, e.g. sodium hydrosulphite, is incorporated into the normal coating mixture, which is then applied and dried in the usual manner. C.O.C.

Preventing the Darkening of Paper sized with Alum Soap

American Cyanamid Co. *USP* 2,875,045

Precipitation of the size on to the paper in presence of a little of a dissolved ionised thiosulphate inhibits darkening of the paper by oxidation of any iron present. C.O.C.

Improving the Opaqueness of Paper

Framalite *BP* 816,031

1–20% (based on the dry wt. of the pulp) of "acid titanium gel", resulting from the hydrolysis of titanium sulphate solns. and containing 30–35% of TiO_2, is added to the aqueous pulp suspension, together with a silicate, aluminate, resinate, zincate, stannate or antimonite of Na, K or NH_4, keeping the mixture alkaline. R.A.

Pigment Mixture for Incorporation in Ripened Viscose (VI p. 503)

Flame Resisting Cellulose Acetate or the like (VI p. 504)

Bleaching and Sizing Paper Pulp (VII p. 504)

Opaque Aluminium Foil-like Coatings on Cloth, Paper, and other Fibrous Materials (X p. 507)

Coating Fibrous Structures with Tetrafluoroethylene Polymer (X p. 507)

XII— LEATHER; FURS; OTHER PROTEIN MATERIALS

Structure of Cystine Disulphoxides

B. J. Sweetman *Nature*, **183**, 744–745 (14 March 1959)

Compounds known as disulphoxides and formulated R·SO·SO·R from the chemical evidence, are, from the infrared data, likely to be thiolsulphonates, $R{\cdot}SO_2{\cdot}S{\cdot}R$. The second formulation affords a simpler explanation for the production of cystine and cysteine sulphinic acid from the reaction of cysteine with "cystine disulphoxide". E.V.T.

PATENT

Brightening Dyed Suède Leather which has become Dull

Palco Chemical Co. *USP* 2,876,130

The leather is sprayed with a solution of a fluorescent brightening agent, a hygroscopic agent which itself retains $< 10\%$ moisture in air at 20°C. and 40% RH, and a water-miscible organic solvent evaporating faster than

water, e.g. ethyl alcohol (43·30 by wt.), β-methyl umbelliferone (0·03), Igepal CA conc. (3·22) and water (53·45). C.O.C.

Leather Dyeing (VIII p. 505)
Coating Fibrous Structures with Tetrafluoroethylene Polymer (X p. 507)

XIII— RUBBER; RESINS; PLASTICS

Mechanism of Combined Polymerisation

G. A. Shtraikhman

Zhur. priklad. khim., **32**, 673–676 (March 1959)

The equation for the polymerisation involving three components shows that the polymer composition is connected with the concentration of the functional groups in the reaction mass. T.Z.W.

Polymerisation of Caprolactam

A. S. Shpital'nyĭ, M. A. Shpital'nyĭ, and N. S. Yablochnik

Zhur. priklad. khim., **32**, 617–624 (March 1959)

The interaction of caprolactam with excess of NaOH at 280°c. leads to the formation of Na salt of aminocaproic acid. The equations put forward show the reaction mechanism. A stepwise character of the process, making it similar to other reactions leading to the formation of other polyamide polymers is proved. T.Z.W.

Depolymerisation of Polycaprolactam

N. D. Katorzhnov and A. A. Strepikheev

Zhur. priklad. khim., **32**, 625–628 (March 1959)

Depolymerisation of the polycaprolactam was carried out by heating the polymer in sealed ampoules at 230–250°c. The yield of caprolactam was determined by extraction with boiling benzene and drying the residue at 100°c. under vacuum. The results showed that the speed of the depolymerisation is directly proportional to the temp. and the moisture content of the polymer, and inversely to its molecular wt. T.Z.W.

Influence of Agitation on Speed of Polymerisation of Acrylonitrile

E. S. Roskin

Zhur. priklad. khim., **32**, 676–680 (March 1959)

The speed of the polymerisation of acrylonitrile in an aqueous medium and the length of the induction period depend upon the intensity of the agitation and is directly proportional to it. It is assumed that the polymerisation takes place according to an emulsion mechanism, in which a great number of the monomer molecules in a cluster or a cloud form, takes part. The existence of the acrylonitrile clusters is possible because of its low solubility in water. The stability of the molecular clusters is greatly increased by the establishment of the polymerisation centre, which is an initial polymer chain. This stabilising influence is opposed by the agitation of the reaction mass. A similar effect is exhibited by supersonic waves. T.Z.W.

Hetero-chain Polyamides. IX— Preparation of Polyamides and Polyamidoesters from Bisoxazolones

T. M. Frunze, V. V. Korshak, and L. V. Kozlov

Izvestiya Akad. Nauk S.S.S.R., otdel. khim. nauk, 535–539 (March 1959)

The synthesis of polyamides (PA) and polyamidoesters from bisoxazolones (I) and diamines (II), glycols, or aminoalcohols is described. PA (m.p. 200–220°c.), obtained from I and II have higher m.p. and possess a more regularly arranged mol. structure than those prepared by direct polycondensation. G.J.K.

Hetero-chain Polyesters. XV— Mixed Polyesters of Tetramethylene Glycol and two Dicarboxylic Acids

V. V. Korshak, V. V. Golubev, G. V. Karpova, and T. A. Dubova

Izvestiya Akad. Nauk S.S.S.R., otdel. khim. nauk, 540–545 (March 1959)

Ten polyesters from tetramethylene glycol (I) and a mixture of two dicarboxylic acids have been prepared and their physical properties tabulated. Polyesters from two aliphatic acids (in all proportions) form fibres at a lower temp. than the aromatic-aliphatic polyesters and are all sol. in benzene. Many of the mixed polyesters of I form sufficiently strong, cold-drawn fibres and films. G.J.K.

PATENTS

Cross-linking or Vulcanising Synthetic Resins or Rubbers by Ionising Radiations

Centre National de la Recherche Scientifique *BP* 816,791

Unless the radiation treatment is carried out in absence of molecular oxygen both on the surface and within the polymer degradation both of the surface and the mass of the polymer may result from oxidation. C.O.C.

Vinylidene Chloride–Vinyl Chloride Copolymer and Yellow Dyes of Poor Light Fastness as a Constant Colour Composition

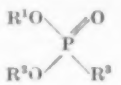
Firestone Tire & Rubber Co. *USP* 2,875,173

Vinylidene chloride resins can be made of constant colour if they are coloured with a light-fugitive yellow colorant which fades at the same rate that the resin yellows on ageing. Curcumin (C.I. 75300) is very suitable for this purpose. C.O.C.

Flame-resistant Polyester Composition containing a Halogenated Phosphonate

American Cyanamid Co. *USP* 2,877,204

Incorporation of a compound of formula—



(R^1 and R^2 = hydrocarbon; R^3 = mono- or dihalogenated methyl) e.g. dipropyl chloromethyl phosphonate, into heat-convertible liquid resin compositions containing an unsaturated ester of a polyhydric alcohol and an ethylenically unsaturated polycarboxylic acid and a monomer containing a $CH_2{:}C<$ group, yields on curing a light coloured, transparent hardened polyester resin resistant both to fire and to yellowing when exposed to ultraviolet radiation. C.O.C.

Decorated Plastic Sheeting

United States Rubber Co. *USP* 2,874,416

An extremely thin, preferably clear, continuous layer of resinous coating is printed from a dispersion on to the surface of an inextensible carrier sheet, e.g. of paper. Then a design is printed on to this coating. Then a body layer of the film is cast on the coating over the printing. The coating and the film are then fixed together with the printing between them and the resulting decorated sheeting is stripped from the carrier sheet. C.O.C.

Decorating Thermosetting Plastics during Moulding

Pro-Phy-Lac-Tic Brush Co. *USP* 2,874,419

The design is printed by the letter process using an ink containing a melamine type resin on to a rayon overlay paper, e.g. Hurlbut No. 900. The printed paper is then impregnated with a melamine resin precondensate and a curing catalyst and cured. The paper should now contain 60–75% by weight of resin. The resin-treated paper is then placed with its unprinted side against the hot surface of a mould, resin to completely cover the edges of the paper. This hot melamine resin roughly made into shape (the "preform") is then placed in the mould, the edges of the preform overlapping those of the paper. Moulding and curing then follow in the normal manner. C.O.C.

Compositions for Rendering Synthetic Films and Fibres Non-adherent, Heat-sealable at Low Temperatures, and Antistatic (III p. 498)
Chemically Bonding Coatings to Organic Polymers (X p. 507)

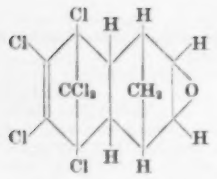
XIV— ANALYSIS; TESTING; APPARATUS

Colour Reaction for Dieldrin and Endrin

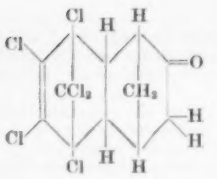
E. J. Skerrett and E. A. Baker

Chem. and Ind., (17), 539 (25 April 1959)

Dieldrin or endrin (spatial isomers of I) yield ketones (II) on heating with the boron trifluoride–diethyl ether complex in benzene. Red colours are then produced by the action of tetraethylammonium chloride on ethanolic soln. of the 2,4-dinitrophenylhydrazones of II. Sensitivity is 10 μg. of I.



(I)



(II)

A.J.

Reaction of Sodium Tungstate with Stilbene-4,4′-bis [(Azo-1) - 3,4 - dihydroxybenzene] - 2,2′-disulphonic Acid ("Stilbazo") in Aqueous Solutions. II— Action of Organic Solvents and Effect of some Salts
K. E. Kleiner and A. Kh. Klibus
Zhur. obshch. khim., **29**, 34–40 (Jan. 1959)

The action of some organic solvents on solutions and precipitates of stilbazo (I) and the blue stilbazotungstate compound (II) have been investigated colorimetrically. By using methanol, or a methanol–benzene mixture, it is possible to separate II from excess I, and to determine 5–10 μg. tungstan in 10–15 ml. solution. Phosphoric acid, sodium fluoride, excess sodium molybdate, stannous and stannic salts interfere. Alkali metal salts in concn. > 0·01–0·02 N. accelerate (*a*) the reaction between sodium tungstate and I and (*b*) the coagulation of II.
G.J.K.

Identification of Pigments in Paint Products by Infrared Spectroscopy
T. R. Harkins, J. T. Harris, O. D. Shreve
Anal. Chem., **31**, 541–545 (April 1959)

The pigment is separated from the paint product by high-speed centrifuging, washed with acetone–toluene mixture, and dried at 110°c. The solid is finely ground then mulled with Nujol to give a sample suitable for determination of the infra-red spectrum.

The spectra of 21 inorganic and 5 organic pigments are given and classified according to the number and shape of the absorption bands.

The method is rapid and allows the identification of specific compounds in a mixture. A disadvantage is that several inorganic pigments do not exhibit characteristic absorption bands. P.B.S.

Improved Crockmeter for Yarn Testing
S. Korpauty and C. R. Trommer
Amer. Dyestuff Rep., **48**, 40 (23 March 1959)

An improved method of mounting the material under test when using the Crockmeter previously described by C. R. Trommer (Modification of the A.A.T.C.C. Crockmeter for Yarn Testing, *Amer. Dyestuffs Rep.*, **45**, No. 12, 357–9 (1956)) is described. The width of sample is not very critical, but fibres must be fairly taut, must be completely parallel to each other, and only one layer thick.
W.P.M.

Evaluation of the Celanese Wrinkle Tester
E. R. Kaswell
Amer. Dyestuff Rep., **48**, 56–60 (6 April 1959)

The Stoll–Celanese wrinkle tester and the evaluation of the Stoll–Celanese wrinkle testing procedure, are described. Results obtained by this method are compared with those obtained by the Monsanto Crease Angle, Cyanamid Crease Angle and Hebeler Kolb Profile Height wrinkle tests. Good correlation exists among all tests with the exception of the Hebeler Kolb. The A.A.T.C.C. committee did not recommend the Stoll–Celanese test as a standard test method. W.P.M.

Chromato-electrophoresis applied to the Analysis of Cellulosic Materials
J. Derminot
Bull. Inst. Text. France, (80), 71–77 (April 1959)

Chromatography on paper in *sec.*-butanol–formic acid–water (75:15:10), followed by electrophoresis in a borate buffer, gives effective separation of the sugars present in hydrolysates of cellulosic materials. J.C.F.

Detection of Damage in Viscose Filaments
E. C. Jolliff
Text. Research J., **29**, 279–281 (March 1959)

A modified version of Gram's staining technique enables inclusions and surface damage to be more readily detected in viscose rayon filaments. S.B.D.

Identification of Unknown Synthetic Fibres. II— Application of Polarised Light Microscopy
S. G. Smith
Amer. Dyestuff Rep., **48**, 35–39 (23 March 1959)

An investigation of the polarised light microscopy of synthetic textile fibres is described. Its incorporation into an analytical scheme for the identification of such fibres (previously described— Identification of Unknown Synthetic Fibres— Part I. *Amer. Dyestuff Rep.* (10 March 1958)) is discussed. Results with a first order red retardation plate are given for several fibres. The first order red plate can quickly point out the presence of different fibres in a blend if such fibres are respectively optically positive and negative. A correction for Part I of the paper is given. W.P.M.

Cupriethylenediamine— Use in the Study of Wool Structure
M. Levean
Bull. Inst. Text. France, (79), 79–83 (Feb. 1959)

When fine wool fibres possessing a bilateral structure are treated with cupriethylenediamine solution, the ortho-cortex swells to a much greater extent than the para-cortex, and the cells break up into macrofibrils. Coarser fibres with a peripheral-axial structure exhibit a less sharp distinction, and are best examined by phase-contrast microscopy. Cupriethylenediamine treatment inverts the staining behaviour of ortho- and para-cortical cells towards methylene blue. J.C.F.

Sulphur— Estimation in Keratins
P. Pigache and G. Biserte
Bull. Inst. Text. France, (80), 93–96 (April 1959)

Keratin sulphur is rapidly oxidised by perchloric acid–nitric acid in the apparatus of Bethge (*Anal. Chem.*, **28**, 119 (1956)), which prevents the loss of sulphur in volatile form. The sulphur is weighed as $BaSO_4$.
J.C.F.

Spacing of the Blue Light-fastness Standards
K. McLaren J.S.D.C., **75**, 196 (April 1959)

Identification of Mildew Inhibitors by a Qualitative Chromatographic Method
T. D. Miles and A. C. Delasanta
Amer. Dyestuff Rep., **48**, 31–32 (6 April 1959)

A qualitative paper chromatographic method, for the identification of mildew inhibitors used on fabrics, is described. The material is extracted with carbon tetrachloride and a drop of the mixture is placed on a paper chromatograph, dried, eluted with the appropriate solvents and the chromatogram developed. Copper-8-quinolinolate, salicylanilide, 2,2′-methylene bis-(4-chlorophenol) and zinc salts of dithiocarbamic acid can be identified. W.P.M.

Microscopic Examination of Fibres, Paper, Board, and Wood. I— Improved Methods for the Study of Surfaces
D. H. Page and H. W. Emerton
Svensk Papperstidning, **62**, 318–332 (15 May 1959) (*in English*)

Metal shadowing in which a thin metal film is deposited obliquely on to the specimen gives the illusion of oblique illumination while maintaining conditions for max. resolution. Paper and similar translucent materials can be examined directly but replica methods have to be employed for opaque objects. The technique of metal shadowing in general is outlined and two replica methods are described. The zero-stage method is preferred for paper and board while both this and the two-stage method may be used for wood (16 references). R.A.

Sodium Hydroxide Method in Quantitative Analysis of Textiles
SNV 955 45 *Textil-Rund*, **14**, 336–337 (June 1959)

Standard methods are set out for the separation and estimation of suitable fibre mixtures. S.R.C.

Felts containing Cellulose and Casein Fibres— Quantitative Analysis
K. Korthum and M. Asbrand
Melliand Textilber., **40**, 193–196 (Feb. 1959)

An apparatus suitable for comminuting felt is depicted. The sample is extracted for 3 hr. with CCl_4, boiled twice with dist. water for 15 min. Cellulose is determined by boiling a 3 g. portion under reflux for 15 min. with 150 ml. of 2% KOH, filtering (glass), rinsing, stirring the residue

for 15 min. at room temp. with NaClO containing 50 g. active Cl per litre, filtering, washing with dist. water, dil. CH_3COOH, and water, drying to constant weight, and weighing (correction factor 1·04). In isolation neither reagent completely dissolves the casein without attacking the cellulose. Wool is determined by boiling a 3 g. portion with stirring for 15 min. with 300 ml. of 0·2% H_2SO_4, digesting for a further 15 min. in a waterbath, filtering (glass), washing with 1 litre boiling water, boiling for 10 min. with water, filtering, and washing with 1 litre each of boiling and cold water. The sample is then agitated at 40° C. for 2 hr. in 100 ml. water containing 1 g. trypsin and 0·3 g. $NaHCO_3$, filtered, washed successively with dist. water, tap water, and dist. water, dried and weighed. 5% of the wool and 0·7% (negligible) of the cellulose is destroyed by the treatment. The previously determined weight of cellulose is subtracted from the residue to obtain the weight of the wool (correction factor 1·05). Casein is determined by difference. Numerous practical results are tabulated. There are 8 references.

S.M.J.

Degradation of Wool and Hair by Papain

A. W. Holmes

J. Textile Inst., **50**, T 422–T 423 (June 1959)

The rate of attack by papain on wool is increased by prior oxidation, chlorination, or bromination. Papain first liberates cuticle cells from untreated human hair, and these are followed by cortical cells. The proportion of cortical to cuticle cells after a fixed time has been found to be a guide to previous treatments of the hair, and the author suggests that the method may be applicable to the investigation of treatments wool samples have received.

P.T.S.

Determination of Curl Strength of Permanently Waved Hair

E. J. Stavrakas, M. M. Platt, and W. J. Hamburger

Proc. Sci. Sect. Toilet Goods Assoc., (31), 36–39 (1959): *Chem. Abs.*, **53**, 14423 (10 July 1959)

Method for evaluating the resistance to deformation of curls and waves formed by various treatments.

C.O.C.

Gravimetric Determination of Silicon in Textiles

G. D. Nessonova and D. V. Turkovskaya

Izvest. Vysshikh. Ucheb. Zavedenii, Tekhnol. Tekstil. Prom., (5), (109–113 (1958): *Chem. Abs.*, **53**, 7606 (25 April 1959)

Dry ashing textiles in an open crucible gives errors of as much as 30–40%. Of six oxidising mixtures examined for the disintegration of cotton, wool, and viscose rayon the best were conc. H_2SO_4 and HNO_3 and conc. H_2SO_4 with SeO_2.

C.O.C.

Apparatus for Determining the Flame Temperature of Textiles

L. G. Beloborodova

Uchenye Zapiski Tomsk. Unic., (26), 111–114 (1955): *Referat. Zhur., Khim.* Abstr. No. 76149 (1956): *Chem. Abs.*, **53**, 7688 (10 May 1959)

Detailed description of an electrical apparatus for measuring the flame-resistance of cloth within $\pm$ 5°c.

C.O.C.

Micro-dyeing Apparatus for Laboratory Use

F. Péter and B. Mihalik

Magyar Textiltech., 163–164 (1956): *Chem. Abs.*, **53**, 14521 (10 July 1959)

Describes apparatus in which a very small sample can be placed in a thermostat-regulated water bath and directly heated if necessary. The liquor ratio is variable within wide limits and the dyeing processes are visible to the naked eye. Vat and sulphur dyes can be particularly well studied. The apparatus is simple to operate and cheap to make.

C.O.C.

Experiments in Colour Vision

E. H. Land *Scientific American*, **200**, 84–99 and 204–206 (May 1959)

The work discussed brings an entirely fresh outlook to the mechanism of colour vision. It relates to the study of colour vision under natural conditions in complete images.

The author refers to one of Newton's experiments in which a beam of white light is dispersed by means of a prism; the spectrum thus produced meets a board having two narrow slits just inside the ends of the yellow bands in the spectrum. When the two beams meet on a white screen, a yellow colour is produced, as would be anticipated. The author inserted in front of the slits a pair of black-and-white photographic transparencies of the same scene, and the yellow beams pass through these on to the screen. This time the whole range of colours in the original scene of the photograph is shown on the screen.

A simpler and more convenient arrangement for combining images is to use colour filters instead of narrow slits. Thus a photograph was taken with a camera having a red filter and an exactly similar one with a green filter. The images were photographed on to ordinary black-and-white film, and from the negatives the usual black-and-white transparencies were made. Both images were then projected on to a screen in such a way as to superimpose the two images but using a red filter for the "red" transparency and a green filter for the "green". Again the screen shows the full range of colours in the original scene.

In both these experiments the whole range of colours—spectral and non-spectral—in the original scene are reproduced, although light of only two wavelengths is used. This is a general principle which applies where a pair of photographs of the same scene is illuminated by light of two different wavelengths or even if the light is derived from bands such as are given by filters. The long-wavelength photograph must be illuminated by the longer band, and the short-wave photograph by the shorter band. The width of the band is immaterial; indeed, one of the bands may be white light itself, i.e. the whole visible spectrum, instead of green light in the last experiment mentioned. The author has also shown that these remarkable effects are virtually unaffected by the intensities of the two beams. Thus the intensity of one beam can be very considerably lowered without any difference in the colours shown on the screen.

The trichromatic theory of colour vision, which holds that a sensation of any colour (including white) is derived from stimulation to varying degrees of the three sets of colour receptors—red, green, and blue-violet—cannot account for the varied colours in a composite scene in which they are spread over the whole field of vision. Here the eye perceives colours by comparing long wavelengths and shorter wavelengths, and the author has established that there is a fulcrum between the two wave-bands at 588 mμ, in the yellow region of the spectrum. He suggests that the eye acts as an enormously complex computer which establishes a fulcrum wavelength and divides the incoming wavelengths on to the long side or the short side around it. Thus the colour of natural images depends on a varying balance between longer and shorter wavelengths over the total visual field.

Although the author deals only with two sources of light in his experiments, he is careful to point out that he is not advocating a two-colour theory of vision. He intends to carry out further tests using three sources of light, and the results will be awaited with extreme interest.

F.J.

Felisol—An International Informative Label for Colour Fastness

K. McLaren J.S.D.C., **75**, 237–242 (May 1959)

Fading of Blue Standards in Sunlight in Buenos Aires

A. A. Quartino *A.Q.T. Boletín Técnico Informativo*, **1**, 17–32 (Dec. 1958)

Fading is somewhat more rapid than in Northern Europe but is analogous to conditions in Spain, Italy, and Greece.

S.R.C.

Testing of Fastness to Pleating

L. Meckel *Textil Praxis*, **14**, 519–520 (May 1959)

The apparatus, made of glass, has two main components: (1) a beaker type vessel (with a side arm) containing water, (2) a bottle-shaped double-walled container with two side arms and sockets to accommodate thermometers. A dyed pattern to be tested is inserted through the neck of the upper container and suspended between the two thermometer bulbs. The water in the lower compartment is heated with a Bunsen burner and it is claimed that the temperature of the test sample can be maintained at 90 $\pm$ 2°c. The time of treatment is 20 min. When the pattern is cool its shade is compared with that of the original.

L.A.T.

Estimation of the Water and Steam Fastness of Dyes for Paper Tubes
VSPPF-EMPA C 3021 *Textil-Rund.*, **14**, 277 (May 1959)
Undyed cotton, wool, silk, and nylon yarns are wound on the tube under test and the assembly exposed under standard conditions. S.R.C.

Sensitometry of Colour-photographic Materials and Processes
G. S. Baranov, N. S. Ovechkis, E. D. Katsenelenbogen, and L. K. Krupenin
Wiss. Phot., Intern. Konf. Köln., 522–525 (1956): *Chem. Abs.*, **53**, 6848 (25 April 1959)
A description of the complete sensitometric testing of colour photographic materials and the necessary apparatus. C.O.C.

Quick Test for ascertaining the Suitability of a Solution of a Resin Precondensate for Use in producing a Crease-shedding Finish
A. Junghahn and R. Grünwald
Deut. Textiltech., **8**, 611–614 (1958): *Chem. Abs.*, **53**, 9681 (25 May 1959)
To 12 c.c. of the working liquor add 1 c.c. of 1% aqueous Crystal Ponceau 6R Extra (C.I. Acid Red 44). Transfer 1 drop of this solution to a bent piece of filter paper held in the hand or laid on a concave surface like an open beaker until dry (1–3 min.). In presence of a precondensate suitable for producing a crease-shedding finish, a red circular spot appears. A partially condensed precondensate shows an intense ring in the centre of the spot because of the collecting of molecular aggregates. With increasing aggregation the spot appears to be stratified and this indicates that the liquor is unsuitable for use. C.O.C.

Colorimetric Determination of Methylcellulose with Diphenylamine
Anal. Chem., **31**, 1383–1385 (Aug. 1059)
An aqueous solution of the sample is mixed with the diphenylamine reagent (a solution of diphenylamine in glacial acetic and conc. hydrochloric acids) and heated at 108°c. for 30 minutes. The mixture is cooled in cold water for 10 minutes and the absorption at 640 mμ measured. A set of standards is included with each heating. The mean deviation of the results is $\pm$ 2·1%. P.B.S.

Analysis of Mixtures of Amino Acids by Gas-phase Chromatography
C. G. Younger *Anal. Chem.*, **31**, 1019–1021 (June 1959)
Amino acids and a protein hydrolysate are converted to their *N*-acetyl butyl esters and fractionated on a column of firebrick coated with hydrogenated vegetable oil. Quantitative results are obtained for glycine, alanine, valine, leucine, isoleucine, and proline. P.B.S.

Purification of Plant Amino Acids for Paper Chromatography
J. F. Thompson, C. J. Morris, and R. K. Gering
Anal. Chem., **31**, 1028–1031 (June 1959)
A modified method for the separation of amino acids using a sulphonic-acid ion-exchange resin. The procedure removes water-soluble substances, which interfere with paper chromatography, without causing the breakdown of labile compounds, and separates the basic amino acids from the others. The neutralised solution is passed through a column containing the ammonium form above the hydrogen form of the resin. The two columns are separated, and the amino acids eluted. The ammonium form contains the basic amino acids and the amines, whilst the acid form retains the neutral and acidic amino acids. P.B.S.

Determination of Amino Acids from Plants by Paper Chromatography
J. F. Thompson and C. J. Morris
Anal. Chem., **31**, 1031–1037 (June 1959)
The method is designed to give a more accurate determination than previous methods. Neutral and acidic amino acids are separated on a two-dimensional chromatogram using a butanol–acetic acid solvent in one and phenol solvent in the other direction. The leucines with phenylalanine and the basic amino acids are separated on unidirectional chromatograms using benzyl–t-butyl alcohol solvent and phenol solvent respectively. In all cases the spots are located with ninhydrin, and then cut out. In most cases the colour is then extracted from the paper with 50% alcohol solvent, and the acid determined from the absorption of the solution at 570 mμ. With certain acids the extract is first treated further with ninhydrin, to give complete reaction, before measuring the absorption.
A coefficient of variation of 5% or less for all amino acids, and $< 3\%$ for most amino acids, is obtained. P.B.S.

Cysteic Acid in Wool Hydrolysates— Separation and Estimation by Electrophoresis (VI p. 503)

XV— MISCELLANEOUS

Adjusting pH without introducing Extraneous Cations or Anions
J. E. Powell and M. A. Hiller
J. Inorg. & Nuclear Chem., **9**, 100 (1959): *Chem. Abs.*, **53**, 8777 (25 May 1959)
Cl^--form anion resin loaded with OH^- was added to a solution whose pH was to be adjusted so that the equivalence point was exceeded. The solution was back-titrated with the acid of the anion of the salt solute to reach the hydrolytic pH of the cation of the salt solute. The solution was heated to effect homogeneous solution of cation hydrous oxide. The method works for all cases where the resin adsorbs the anion better than it absorbs OH^-, e.g. for Cl^-, Br^-, NO_3^-, I^-, and ClO_4^- salts of any metal. C.O.C.

Pigments, Lakes, and Dyes in Cosmetics
D. F. Anstead
J. Soc. Cosmetic Chemists, **10**, 1–20 (1959): *Chem. Abs.*, **53**, 8544 (10 May 1959)
Review, including U.S. and British regulations. C.O.C.

Colouring Medicinals with Artificial Dyes
E. Hannig *Pharmazie*, **13**, 628–631 (1958): *Chem. Abs.*, **53**, 7504 (25 April 1959)
A list of acceptable green, red, yellow, black, blue, and orange dyes for colouring tablets. It does not include those used as warning colours, e.g. in disinfectants. C.O.C.

Biochemistry of Vision
J. Methfessel *Pharmazie*, **13**, 681–685 (1958): *Chem. Abs.*, **53**, 8346 (10 May 1959)
Review of current developments, 25 references. C.O.C.

PATENTS

Treating Hen Feathers with Aldehydes or Glucose
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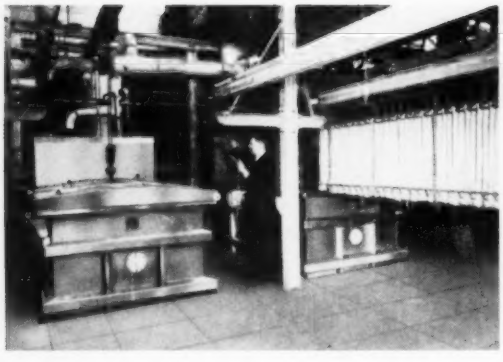

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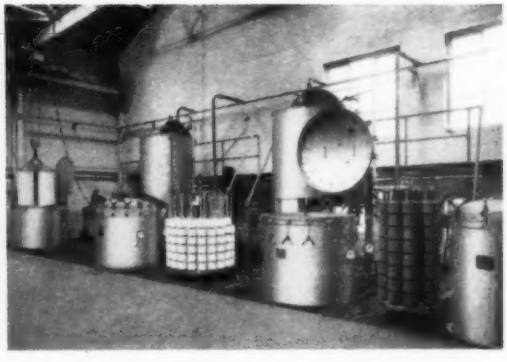

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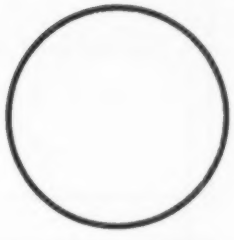

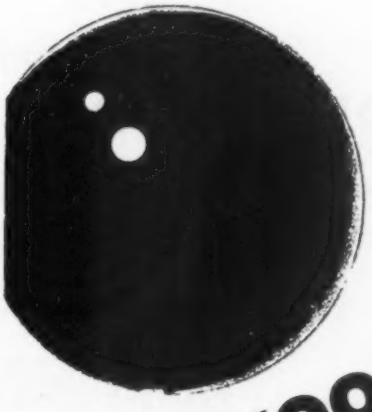

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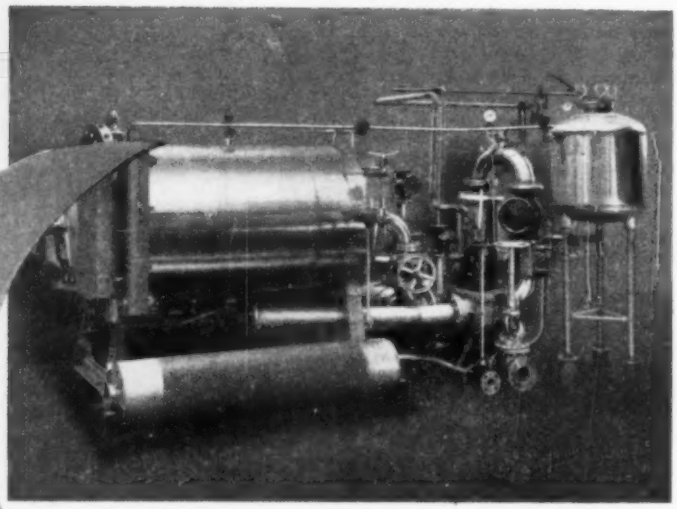

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PAGE	
xxxiv	AMOA CHEMICAL CO LTD
xxi	ANDREW ENGINEERING & DEVELOPMENT CO LTD
xv	ASSOCIATED CHEMICAL COMPANIES (SALES) LTD
xviii	BADISCHE ANILIN- & SODA-FABRIK A G
xxii	B I P CHEMICALS LTD
xxxiv	J C BOTTOMLEY & EMERSON LTD
xvii	BROTHERTON & CO LTD
xxxiii	BROWN & FORTH LTD
xxiii	CATOMANCE LTD
xx	CIBA LTD
xvi	CIBA CLAYTON LTD
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xxxv	CHAS. FORTH & SON LTD
xix	GEIGY CO LTD
xxviii	GEIGY CO LTD
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xli	HUNT & MOSCROP LTD
viii	IMPERIAL CHEMICAL INDUSTRIES LTD
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vii	SANDOZ PRODUCTS LTD
ix	SANDOZ PRODUCTS LTD
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xxxv	SHIRLEY DEVELOPMENTS LTD
xxiv	F SMITH & CO (WHITWORTH) LTD
v	STANDARD CHEMICAL CO
xxix	TENNANTS TEXTILE COLOURS LTD
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xxvi	VINYL PRODUCTS LTD
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